

**LEARNED HELPLESSNESS, SELF-WORTH PROTECTION  
AND ATTRIBUTIONAL RETRAINING FOR PRIMARY SCHOOL CHILDREN**

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LEARNED HELPLESSNESS, SELF-WORTH PROTECTION  
AND ATTRIBUTIONAL RETRAINING FOR PRIMARY SCHOOL CHILDREN

by

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I certify that this thesis contains no material which has been accepted for the award of any other higher degree or graduate diploma in any university, and that to the best of my knowledge the thesis contains no copy or paraphrase of materials previously published or written by another person, except where due reference is made in the text of the thesis.

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ABSTRACT

This series of three studies examines the effectiveness of an attributional retraining program for primary school children, whose performance is detrimentally affected by failure.

One explanation for impaired performances after failure suggests that students who attribute lack of success to inability become academically helpless. This approach, with its roots in learned helplessness theory and Weiner's theory of achievement-motivation, predicts a successful outcome from attributional retraining programs which encourage students to attribute academic successes and failures to the presence or absence of effort.

A second explanation suggests that some students perform more poorly after failure because they 'give up' in order to protect a sense of self-worth. This is threatened when failure occurs in conjunction with high levels of effort. It is predicted that effort attributional retraining will not influence the performance of students motivated by such considerations.



The first experiment aimed to improve the persistence of Grade 5 and 6 children who displayed helpless behaviour on a puzzle completion task. Attributional retraining involved observation of a model who was rewarded for attributing outcomes to effort. At post-testing, increased persistence was found in female, but not male subjects. One possible explanation for the sex difference is that the males were not helpless but were motivated to protect self-worth and were therefore not willing to expend effort when failure was likely.

In the second experiment, the effectiveness of training was compared for two groups of upper primary school children identified as either helpless or self-worth motivated. Before training both groups showed impaired performance after failure on an arithmetic task. In addition, the latter group demonstrated an improvement in performance in response to a mitigating circumstance, (a description of the task as 'very difficult'), which could explain failure without implicating low ability as the cause. As predicted, effort attributional retraining, this time using a participant modelling technique, inoculated the helpless group against failure, and resulted in an increased emphasis on effort and decreased emphasis on ability in accounting for failures. In the self-worth group, there was no change

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in performance after failure or in ability attributions after training, although there was an increased emphasis on effort.

The effectiveness of the participant modelling procedure was further established in a third experiment, in which helpless students again appeared to be inoculated against failure. This effect was maintained over a two week post-training period, and there is some evidence that improved performance generalised to an anagram task.

The results are discussed in terms of the effective components of attributional retraining programs, and implications for the alternative explanations for impaired performance after failure.

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## CHAPTER 1

### INTRODUCTION

## CHAPTER 1

### INTRODUCTION

The general topic addressed in this investigation is the alleviation of the debilitating effects of failure. More specifically, the investigation examines the effectiveness of a vicarious attributional retraining program for primary school children, whose performance is detrimentally affected by failure.

The fact that some students exhibit impaired persistence and performance levels when they fail at a particular task represents a considerable problem. This pattern of behaviour may contribute to restricted subject choices and underachievement at school, leading to restricted career choices and vocational underachievement.

There are a number of possible explanations which could account for impaired performances after failure. Amongst these, two major positions - cognitive and motivational - can be discerned (Tetlock and Levi, 1982). Both the cognitive and motivational positions draw on the fundamental

concepts of attribution theory. They emphasise the role of causal explanations or attributions which accompany the perception of academic success or failure.

The cognitive approach is essentially an information-processing one. At its foundation is the assumption that individuals seek causes for the events in their world for the purpose of attaining cognitive mastery, and that the causal ascriptions they reach influence many of their subsequent behaviours, affects and cognitions. In the present context, this suggests, firstly, that a student who fails will search for the cause of failure; and, secondly, that the explanation arrived at will moderate subsequent performances on the same or similar tasks.

The motivational approach asserts that in addition to establishing cognitive mastery of the environment, attributions have important psychological and social functions such as the protection of feelings of self-worth. Ascribing a poor performance to bad luck, for instance, serves to remove responsibility for it from the performer and thus preserves his self-esteem. The deliberate reduction of effort applied to tasks at which initial attempts have been unsuccessful may similarly serve to protect self-worth, and represents a motivational explanation for impaired performances after failure.



A broad view of attribution theories is given in Chapter 2, and the cognitive and motivational approaches are discussed in Chapters 3 and 4 respectively. Chapter 5 focusses on sex, age, IQ and self-concept as variables which moderate responses to failure.

The most successful attempts to inoculate students against the debilitating effects of failure have employed attributional retraining programs (Försterling, 1985). Most of these programs encourage students to view their failures as the result of insufficient effort. They have developed from the seminal study of Dweck (1975) who showed that the performances of 12 children with extreme reactions to failure were dramatically improved when they were trained to accept responsibility for failures and ascribe them to a lack of effort. The rationale and efficacy of attributional retraining programs are discussed in Chapter 6.

Despite their demonstrated success in experimental and field settings, attributional retraining programs have not found widespread employment in normal or remedial classrooms. Practical issues such as cost-effectiveness, identification of appropriate treatment populations, and the generalisation and maintenance of initial treatment gains have yet to be resolved. There is a need for further research to address such practical issues, and also to

advance theoretical understanding of the cognitive versus motivational positions.

Chapters 7, 8 and 9 report three studies, conducted with upper primary school children (Grades 4, 5 and 6), which are designed to address both the practical and the theoretical issues. Finally, the general results and conclusions of the thesis are considered in Chapter 10.

## CHAPTER 2

### ATTRIBUTION THEORIES

## CHAPTER 2

### ATTRIBUTION THEORIES

Explanations for deteriorating performance in the face of failure, and interventions designed to inoculate students against such deterioration, place central importance on the role of attributions. Consequently, an understanding of the basic premises of attribution theories form the foundation for the later chapters of this thesis, and will be presented in this chapter.

Attributional behaviour has been a topic of interest for personality and social psychologists for the past thirty years. Despite this, no single, coherent attribution theory has emerged. Rather there exists a number of different theories sharing some common postulates: firstly, that individuals desire to understand cause and effect relationships in their environment so that they can better predict and control that environment; and secondly, that the sort of causal explanation, or attribution, an individual develops in relation to a particular event, will have consequences for his future behaviour, affects and cognitions.

### The Development of Attribution Theories

Heider (1958) is credited with the founding of attribution theories. He proposed that people seek to perform a "naive analysis of action" which will explain the events in their world in terms of underlying properties or "invariances". The identification of "invariances" means that isolated transitory occurrences can be understood in terms of enduring properties, thus enhancing the prediction and control of future occurrences. Heider proposed that attributions are generally made to two conditions : the condition of "can", which involves the state of the environment and the power or ability of the person to perform the action in question; and the condition of "trying", which involves the actor's intention and exertion. Personal responsibility is associated with "trying" attributions. People are held less responsible for actions that are the result of their abilities or lack thereof, and are not held responsible for actions which are construed as the consequence of environmental factors. A number of derivative theories have arisen (e.g. Jones and Davis, 1965; Jones and Nisbett, 1971; Bem, 1972), proposing a variety of inferential rules used by people in seeking causal understanding. These range from the sophisticated, such as correspondent inference (Jones and Davis, 1965; Jones and McGillis, 1976), to more simple rules, such as a reliance on salient information or the first available adequate explanation (Taylor and Fiske, 1978).

However, it is the work of Kelly (1967, 1971, 1973) which has been most influential. Central to Kelly's theory is the "covariation principle" which states that nominated effects (sensations, perceptions, and responses) are related to variations in entities (stimulus properties of the environment, particular circumstances of a situation, and personal dispositions). An effect is attributed to the state of affairs that covaries with the effect itself. Kelly proposed that in applying this principle, people make use of information about distinctiveness, consistency, and consensus. If an effect is distinctive, it uniquely occurs when the entity is present and not when it is absent; if consistent, then the effect always occurs when the entity is present; and if there is consensus, then virtually everybody experiences the same effect when the entity is present. Different configurations of consensus, distinctiveness and consistency information lead to different attributions. For example, when a behavioural response is highly distinctive, but does not occur regularly in the same or similar situation, then the behaviour is most likely to be attributed to the particular circumstances of the situation, rather than to the person or stimulus properties of the environment.

This classic social psychology approach to attributional behaviour "largely portrays the attributor as a data-driven processor, seeking and evaluating evidence relevant

to an application of the covariation principle." (Metalsky and Abramson, 1981. p.20).

Kelly (1971) argued that in situations in which distinctiveness, consistency and consensus information are scant, precluding a thorough analysis of covariance, then individuals rely on causal schemata in developing attributions. Causal schemata are sets of abstract ideas about the operation and interaction of causal factors. They are gleaned from a number of sources including the observation of cause and effect relationships, experiments in which control has been deliberately exercised over causal factors, and teachings about 'the way the world works'. They provide a framework for the development of quick causal inferences.

Personality psychologists have focussed on the idiosyncratic features of causal schemata, which result in different people making different attributions for the same event. Rotter's (1966) work on locus of control laid the foundation for much of this interest in schemata, with the finding that individuals have a generalized expectancy for internal or external control of events, and that systematic individual differences exist which generalise across situations.

When a person displays consistency in his use of particular schemata, or a tendency to make a particular kind of causal inference across situations and across time, he is displaying an attributional style, (Metalsky and Abramson, 1981). Causal schemata and attributional styles reflect idiosyncratic beliefs and are not necessarily rational. They play an important, although not exclusive, role in determining causal ascriptions. For instance, in cases of conflict between situational information and general beliefs, attributions will be made according to the latter, unless the situational information is overwhelming (Ross, 1977). Attributional retraining is aimed at producing change in maladaptive attributional styles.

In summary, attribution theorists assume that:

- (i) individuals seek causal explanations of events in their world in order to enhance control of that world,
- (ii) the causal explanations or attributions made by individuals influence their future behaviour, cognitions and affects,
- (iii) some individuals display a consistent attributional style.

Each of these explanations has been challenged and inasmuch as such challenges bear on the veracity of



explanations for impaired performances after failure, they will now be briefly discussed.

#### Enhancing Control Through Causal Explanation

Challenges to this assumption can be divided into two questions. Firstly, do individuals desire control over the events in their world? Secondly, do individuals engage in spontaneous attributional search?

In addressing the former, Kelly (1971) stated that:

" attributional processes are to be understood, not only as means of providing the individual with a veridical view of his world, but as a means of encouraging and maintaining his effective exercise of control in that world. The purpose of causal analysis ... is effective control. The attributor is not simply an attributor, a seeker after knowledge. His latent goal in gaining knowledge is that of effective management of himself and his environment. He is not a pure 'scientist' then, but an applied one." (p.220)

De Charms (1968) similarly stressed that individuals need to feel a sense of mastery over their environment in order to avoid being overwhelmed by feelings of incompetence.

This viewpoint, the control motivation hypothesis, has been widely accepted, although the evidence in its favour is largely anecdotal and circumstantial. Attributional biases consistent with the assumption of control motivation have been noted in the experimental literature. For example, Walster (1966) found that increases in attribution of

responsibility for negative events accompany increases in the severity of events, and interpreted this as evidence of the desire to maintain a belief in a controllable world. Wortman (1975) noted that subjects are likely to overestimate the extent of their personal control over random events. In a more direct test of the control motivation hypothesis, Pittman and Pittman (1980) measured subjects' attributional behaviour after varying experiences with lack of control. Attributional activity was found to increase as experiences with lack of control increased.

Evidence bearing on the second question is far more contentious, with some studies showing that individuals do spontaneously engage in attributional search, while others fail to do so. Hanusa and Schulz (1977) found that after experiencing loss of control, subjects did not spontaneously develop a causal explanation for the event, even with specific probing about attributions. Furthermore, Nisbett and Wilson (1977) noted that in accounting for their behaviour, subjects tended to supply plausible retrospective explanations which did not reflect on the cognitive processes that mediated their behaviour, and which could not therefore be considered attributions. Such findings have led Van den Bergh and Eelen (1984) to propose that people engage in behaviour without knowing the real reason why, either before or after the fact.

A contrasting and perhaps more persuasive body of evidence (reviewed in Hastie, 1984; and Weiner, 1985) indicates that individuals frequently engage in attributional search. In a unique study, documenting spontaneous attributional activity in everyday life, Nisbett, Harvey and Wilson (1979) unobtrusively recorded 13 randomly selected conversations between people ranging from students to senior citizens. Analysis of their conversations showed that 15% of all utterances involved a request for, or expression of, an attributional explanation.

Hastie (1984) argues that causal search is most likely to occur under specific conditions:

- (i) the asking of a why question,
- (ii) dependence on others for desired outcomes,
- (iii) the occurrence of unexpected events,
- (iv) failure.

Of these, the unexpected and the experience of failure have been most clearly established as precursors of causal search (Försterling and Groenwald, 1983; Lau and Russell, 1980; Wong and Weiner, 1981). This observation lends further weight to the control motivation hypothesis, since the future can be made more predictable if the reasons for past failures or uncertainties can be discovered and avoided.

### The Mediating Role of Attributions

The assumption that attributions mediate affect, cognitions and behaviour is crucial in the context of this thesis. The influential research of Schachter and Singer (1962), demonstrating the role of cognitive factors in the development of emotional states, provided the earliest empirical evidence of the importance of causal explanations. Their two-factor theory of emotion maintains that an individual's appraisal of a situation produces both a change in the level of physiological arousal and an emotional cognition. For instance, an unscheduled meeting with a ravenous lion is likely to produce increased heart rate and perspiration, and a labelling of the situation as 'extremely threatening'. The arousal and cognition together mediate the emotional response which, in the example cited, is likely to be fear. Should the label be 'this is unexpected', rather than 'threatening', the resulting response is more likely to be surprise. Thus, the same situation and levels of physiological arousal can give rise to different emotions depending on the explanation provided for the arousal. In the absence of a readily available cognition to explain changes in arousal, individuals will actively search for an appropriate explanation. This was established in Schachter and Singer's classic experiment in which subjects injected with adrenalin and with no immediate explanation for the bodily state produced, were readily

manipulated into the disparate feeling states of euphoria and anger by explanations provided by the experimenter.

The exact links between attributions and subsequent affect, cognitions and behaviour have yet to be identified. A variety of connections have been proposed and these will be discussed in Chapters 3 and 4.

### Attributional Style

Research findings are unclear on the existence of consistent attributional styles. While it seems apparent that certain subsets of individuals share a common predisposition towards certain attributions, consistency of attributional styles across situations has not been firmly established.

The search for evidence of consistency has been pursued most extensively in relation to depression. There is considerable evidence of systematic differences in the use of attributions by depressed and non-depressed subjects (e.g. Dobia and McMurray, 1985; Harvey, 1981; Klein, Fencil-Morse and Seligman, 1976; Nelson and Craighead, 1981; Peterson, Bettes and Seligman, 1985). It has been proposed that depressed persons have a characteristic attributional style which involves ascribing negative events to internal, stable and global factors, and positive events to external, unstable and specific factors (Seligman, Abramson, Semmel and Von Baeyer, 1979). Further systematic differences have

been found between high and low test-anxious subjects (Metalsky and Abramson, 1981), high and low self-esteem subjects (Ickes and Layden, 1978) and learned helpless and mastery-oriented students (Diener and Dweck, 1978).

In contrast, the evidence for cross-situational consistency in attributions is scant. (A lone exception is the study by Bar-Tal, Raviv, Raviv and Bar-Tal, (1982) who found that Grade 6 subjects were consistent in the explanations they used to account for their scores on four real-life tests).

Inasmuch as attributional style represents a systematic mode of thinking for a particular individual, it can be considered a trait-like concept. The work of Mischel (1968, 1973) indicates that personality traits have little practical predictive value because patterns of behaviour tend to vary from situation to situation.

It has been demonstrated that causal inferences are influenced by situational factors such as the uniqueness of the event (Feather and Simon, 1971) and the way in which information is presented (Taylor and Fiske, 1978; Nisbett and Ross, 1980). Furthermore, substantial situational specificity of attributions has been demonstrated by Arntz, Gerlsma and Albersnagel (1985), Cutrona, Russell and Jones (1985), Frieze and Snyder (1980), Peterson, Semmel, Von

Baeyer, Abramson, Metalsky and Seligman (1982) and Seligman et al, (1979). In the Frieze and Snyder study, children were asked to explain the outcomes of four familiar achievement situations; an examination, a football game, catching frogs, and an art project. The children viewed each situation differently, and did not evince a consistent attributional style covering all situations.

In reviewing such findings, Cutrona et al, (1985) conclude there is a "need to define more narrowly the concept of attributional style, either in terms of the range of situations to which the concept applies, or in terms of the subset of individuals who possess an attributional style." (p. 1056).

#### The Measurement of Attributions

Research ambiguities may be partially due to problems involved in measuring attributions. With the exception of studies using post hoc analyses of real life events (such as Försterling and Groenwald's (1983) examination of attributional statements about political wins and losses appearing in newspapers after an election), other methodologies use measurement techniques which entail the problem of reactivity. To date the variety of measurement instruments used has been crude and largely unstandardized, making comparability across studies difficult.

Elig and Frieze (1979) compared three commonly used response formats: open-ended responses, ranking techniques in which subjects are asked to divide 100 points among the perceived causes of an event, and rating scales. While open-ended questions allow the subject to generate his own causes and thus reduce demand effects, inconsistent findings may be the result of subtle differences in procedure. A second limitation is the requirement that responses be coded into categories. Rating scales limit the subjects choice to experimenter-generated causes, but are considered by Elig and Frieze (1979) to be the superior format because of their easier quantification and some degree of standardization. Of these, the two most widely used are the Attributional Style Questionnaire (Peterson et al, 1979; Seligman et al, 1979) and the Intellectual Achievement Responsibility Scale (Crandall, Katkovsky and Crandall, 1965).

Studies in which more than one method of attributional measurement has been used have found only low rates of agreement (Turnquist, Harvey and Anderson, 1988).

### Summary and Conclusions

Explanations of the debilitating effects of failure rely heavily on the fundamentals of attribution theories: that people seek causal explanations for events; that the explanations they reach influence their behaviour, cognitions and affects; and that some people display a



consistent tendency to use certain sorts of attributions (although this tendency probably does not generalise across situations).

In the achievement context, this means that after experiencing failure, a student will develop an explanation of the result. Research clearly indicates the experience of failure to be a precipitant of attributional activity. The type of explanation which the student arrives at mediates his thoughts, feelings and performance after the failure. Since some students have been observed to 'give up' after initial failure (i.e. to perform more poorly after failure than before on tasks of equal difficulty), it follows from attributional theory that causal ascriptions have a central role in producing such deterioration. Students who consistently 'give up' may do so because they repeatedly use explanations which predispose them to such behaviour. Theories which seek to detail this process by placing emphasis on the cognitive, information-processing aspects of attributional search, will be reviewed in Chapter 3.

## CHAPTER 3

### COGNITIVE EXPLANATIONS OF IMPAIRED PERFORMANCE AFTER FAILURE

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The theory of achievement motivation proposed by Bernard Weiner (1972, 1979, 1985, 1988) and the reformulated learned helplessness model developed by Abramson, Seligman and Teasdale (1978) are particular examples of the attribution theories broadly described in Chapter 2. Both provide an explanation for impaired performances after failure and a rationale for the efficacy of attributional retraining programs. The two models have developed in parallel, each drawing on aspects of the other. They are discussed in this chapter.

#### Weiner's Theory of Achievement Motivation

Weiner has proposed causal attributions as the building blocks for a general theory of motivation and emotion. The salience he ascribes to them is derived from the observation that causal search is a cognitive activity which spans cultures and time (Weiner, 1985), and which has adaptive significance for control of one's environment (see Chapter 2). Weiner's theory has been employed in understanding

social affiliation (Folkes, 1982) and helping behaviour (Weiner, 1980a, b), but most extensively in relation to achievement. It shares many features with other expectancy-value theories, such as Rotter's social learning theory, (Rotter, 1954), but is linked most closely with Atkinson's theory of achievement motivation (Atkinson, 1964). According to Atkinson, achievement need, a generalised personality disposition, is the major determinant of achievement behaviour and is the result of conflict between pride in success and shame in failure. Weiner's re-interpretation considers achievement need to be only one of a number of antecedents to attributions which are cognitively rather than affectively based, and are the major determinants of achievement behaviour.

#### Causes of Events

Weiner (1985) proposes that although every event has a myriad of possible causes, individuals tend to draw on only a few in making causal attributions. In the context of achievement, successes and failures are usually seen as the consequence of one or a combination of the following factors:

- (i) ability (aptitude and learned skills)
- (ii) aspects of motivation (such as short and long term effort and attention)
- (iii) the actions of significant others

- (iv) physiological factors (such as mood, maturity and health)
- (v) the difficulty of the task
- (vi) luck

(Weiner, 1983)

Of these the four most salient explanations are ability, effort, task difficulty and luck, (Elig and Frieze, 1979; Frieze, 1976; Frieze and Snyder, 1980; Willson and Palmer, 1983) and of these, effort and ability are most frequently cited in explanations of success and failure (Weiner, 1985), i.e.:

I succeeded because I am clever

I succeeded because I tried hard

I failed because I am not clever enough

I failed because I did not try hard enough.

The importance of effort and ability attributions has been noted in a variety of cultures (Triandis, 1972).

The antecedents of such causal ascriptions have not been well defined or researched, although the following factors appear to be important:

- (i) information relevant to the particular performance, such as past success history on similar tasks, pattern of outcome over trials, time spent at the task, social norms for the task,

situational constraints, and reinforcement schedules.

(ii) individual differences such as achievement needs, self-esteem and sex.

(iii) causal rules.

#### A Taxonomy of Causes

For the purposes of simplification and the identification of underlying properties, similarities and differences, causes are classified by Weiner, according to three major dimensions;

(i) locus of causality (internal-external)

(ii) stability (stable-unstable)

(iii) controllability (controllable-uncontrollable)

While other subordinate dimensions may be identified (for example, the dimensions of intentionality and globality) these three are considered to be of most consequence.

The internal-external dimension classifies causes according to their locus; either internal or external to the person. Physiological factors, for instance, are rated as internal and the actions of significant others as external. This classification has its roots in Heider's distinction between factors in the person and factors in the environment, and Rotter's locus of control theory.

The stable-unstable dimension classifies causes according to their degree of constancy over time. Difficulty is usually considered to be a stable factor and luck an unstable factor since it is fluctuating rather than fixed.

The third dimension, controllability, is the most recent to be added to the taxonomy (Weiner, 1985) and has received less research attention. It classifies causes according to the extent to which they are considered subject to volitional control. For instance, effort is usually perceived as being under the volition of the individual and is therefore classified as controllable. Aptitude, in contrast, is perceived as predetermined and is classified as uncontrollable. (Further examples are given in Table 3.1).

Table 3.1: A Taxonomy of Causes - based on a table  
from Weiner (1979)

	STABLE		UNSTABLE	
	CONTROLLABLE	UNCONTROLLABLE	CONTROLLABLE	UNCONTROLLABLE
INTERNAL		Ability	Effort	Mood
EXTERNAL	Teacher Bias	Task Difficulty	Unusual help	Luck from others

The three dimensions are fixed. However, the location of a cause on a dimension may vary over time and between individuals. For example, luck may occasionally be viewed as a property of a person ("Lucky Jim"), making it internal rather than external in locus; and effort may sometimes be viewed as a dispositional trait (industriousness), making it stable, rather than unstable. For this reason, Weiner (1985) in hindsight, relabels ability as aptitude, effort as temporary exertion, difficulty as objective task characteristics and luck as chance. These relabelled causes are less likely to vary from the classification given in Table 3.1. However, the newer terminology is rarely used in the literature.

#### Consequences of Attributions and Attributional Dimensions

Weiner proposed that attributions and attributional dimensions have specific mediating effects on cognitions and affect, which in turn influence behaviour.

*Cognitions:* The stability dimension of attributions is held to mediate expectancy shifts with regard to future success or failure.

Numerous studies confirm that high success expectancies for future outcomes are associated with stable attributions for goal attainment and unstable attributions for failure, while, conversely, low success expectancies accompany



unstable attributions for goal attainment and stable attributions for failure (e.g. Kovenklioglu and Greenhaus, 1978; Pancer and Eiser, 1977; Weiner, Nierenberg and Goldstein, 1976). Real life behaviours add further weight to these experimental findings. In analysing the treatment of criminals, Carroll (1978) reports that parole decisions are in part based on the perceived stability of the cause of the crime. A crime ascribed to a psychopathic personality (stable), for instance, is dealt with more severely and the criminal considered to be a greater 'risk', than a crime ascribed to temporary unemployment (unstable). Crittendon and Wiley (1980) note that females who made unstable attributions for the rejection of a paper for publication (such as a hostile reviewer) were more confident about future publication and had a more positive strategy for resubmission than those who made stable attributions.

This stability-expectancy linkage is critical in explaining deteriorated performances after failure. It implies that students who attribute failure stably (either to low ability or task difficulty) will suffer a decrease in expectancy for future success at the same or similar tasks. Students who attribute failure unstably (to lack of effort or bad luck) will not experience the same moderation of expectancy.

The level of expectancy in turn mediates persistence behaviour and thus has a large influence on student performance. Success expectancy has been clearly established as an important determinant of behaviour in learning and achievement situations (e.g. Crandall, 1969; Rotter, 1966), and is in fact considered to be a principal determinant of action by every major cognitive motivational theorist. Its role has been most clearly defined in self-efficacy theory (Bandura, 1977) which states that perceived self-efficacy ("judgments of how well we can execute courses of action required to deal with prospective situations"; Bandura, 1982, p. 122), is a major determinant of how much effort people will expend, and how long they will persist in the face of obstacles and aversive experiences.

*Affect:* The proposed relationships between attributions and emotions are three-fold. The initial response to a success or failure outcome is held to be a primitive, or general positive or negative, emotion which is based on an immediate appraisal of the outcome. Success is generally accompanied by a feeling of happiness and/or well-being, and failure by sadness and/or frustration. These feelings are outcome-dependent and attribution-independent. Following the initial evaluation, causal attributions are made with distinct emotions being related both to specific attributions and, more importantly, to their dimensions.

These relationships are assumed to be widespread in occurrence, although not invariant.

The groundwork for the proposed attribution-affect linkages was provided by two studies by Weiner, Russell and Lerman (1978, 1979). In the first, subjects were presented with a scenario with a success/failure outcome, and a cause. Subjects rated the degree to which each of 250 affects would be experienced by the participant in the scenario. In the second, subjects reported a critical incident in their own lives, identified the outcome and the cause as they perceived them, and reported three affects experienced. Both studies found a set of affects representing broad positive or negative reactions to outcome regardless of attribution; emotions related to causal dimensions; and emotions related to specific attributions.

Subsequent research indicates that the locus of causality dimension influences those emotions associated with self-esteem, and also the intensity of emotions. Internal attributions heighten intensity (Sherwood, Schroeder, Abrami and Alden, 1981) and give rise to pride when the outcome is successful, and low self-esteem when failure has occurred (Weiner, 1988).

The controllability dimension is pertinent to the emotions of anger, pity, guilt and shame. Events which are

perceived to be negative, self-related and controllable give rise to anger when the controllability is assumed to lie outside the person (being delayed by a traffic jam, for instance) (Weiner, Graham and Chandler, 1982); and guilt when the controllability is assumed to lie within the person (e.g. marital breakdown, or failure due to lack of effort) (Weiner et al, 1982; Jagacinski and Nicholls, 1984). Events which are perceived to be negative and uncontrollable give rise to pity when they concern others (e.g. a baby's physical handicap) (Graham, Doubleday and Guarino, 1984), and shame when they concern oneself (e.g. failure due to inability) (Brown and Weiner, 1984).

The stability dimension influences emotions along the hopelessness-hopefulness continuum. Both positive events with perceived stable causes and negative events with perceived unstable causes give rise to feelings of hopefulness, while the reverse pattern mediates feelings of hopelessness (Weiner et al, 1978, 1979).

Numerous studies (e.g. Dobia and McMurray, 1985; Peterson et al, 1985) indicate that depression, of which hopelessness is a key feature, is associated with internal, stable attributions for failure.

From the preceding discussion, the following predictions can be made: school failure (a negative, self-

related event) which is construed as the result of lack of ability (an internal, uncontrollable and stable factor) will be accompanied by feelings of hopelessness, shame and reduced self-esteem. In comparison, failure, which is construed as the result of lack of effort (an internal, controllable and unstable factor) will be accompanied by feelings of guilt, and reduced self-esteem.

There is some support for these predictions. Brown and Weiner (1984), Covington and Omelich (1984) and Jagacinski and Nicholls (1984), report that shame and related affects such as disgrace, embarrassment and humiliation are linked with attributions for failure to low ability, whereas guilt and related affects such as regret and remorse are associated with attributions for failure to lack of effort.

*Behaviour:* The proposed attribution-behaviour linkage is indirect. Attributions are held to impact on motivated behaviour such as persistence and choice via their influence on success expectancy and affect. A large body of circumstantial evidence indicating that behaviour varies with attributions supports this contention. For example, Dweck and Reppucci (1973) found that those subjects who showed the largest performance decrements after failure were those who took less personal responsibility for the outcomes of their actions (i.e. made external attributions), and when they did accept responsibility, attributed success and

failure to the presence or absence of ability rather than effort. Subjects who persisted longest in the face of prolonged failure placed more emphasis on the role of effort. Similarly, Andrews and Debus (1978) found that attributions for failure to insufficient effort were positively related to persistence, whereas attributions to the stable elements of ability and difficulty were negatively related. Covariation between attributions and school performance has been noted by Stipek and Weisz (1981), and Uguroghu and Walberg (1979).

#### Overview of Weiner's Theory

Weiner's theory is diagrammatically represented in Figure 3.1. A causal search is initiated by an outcome which is important, negative or unexpected. Once a cause or causes are selected, they are located in dimensional space with the ensuing consequences for expectancies, affect and behaviour.

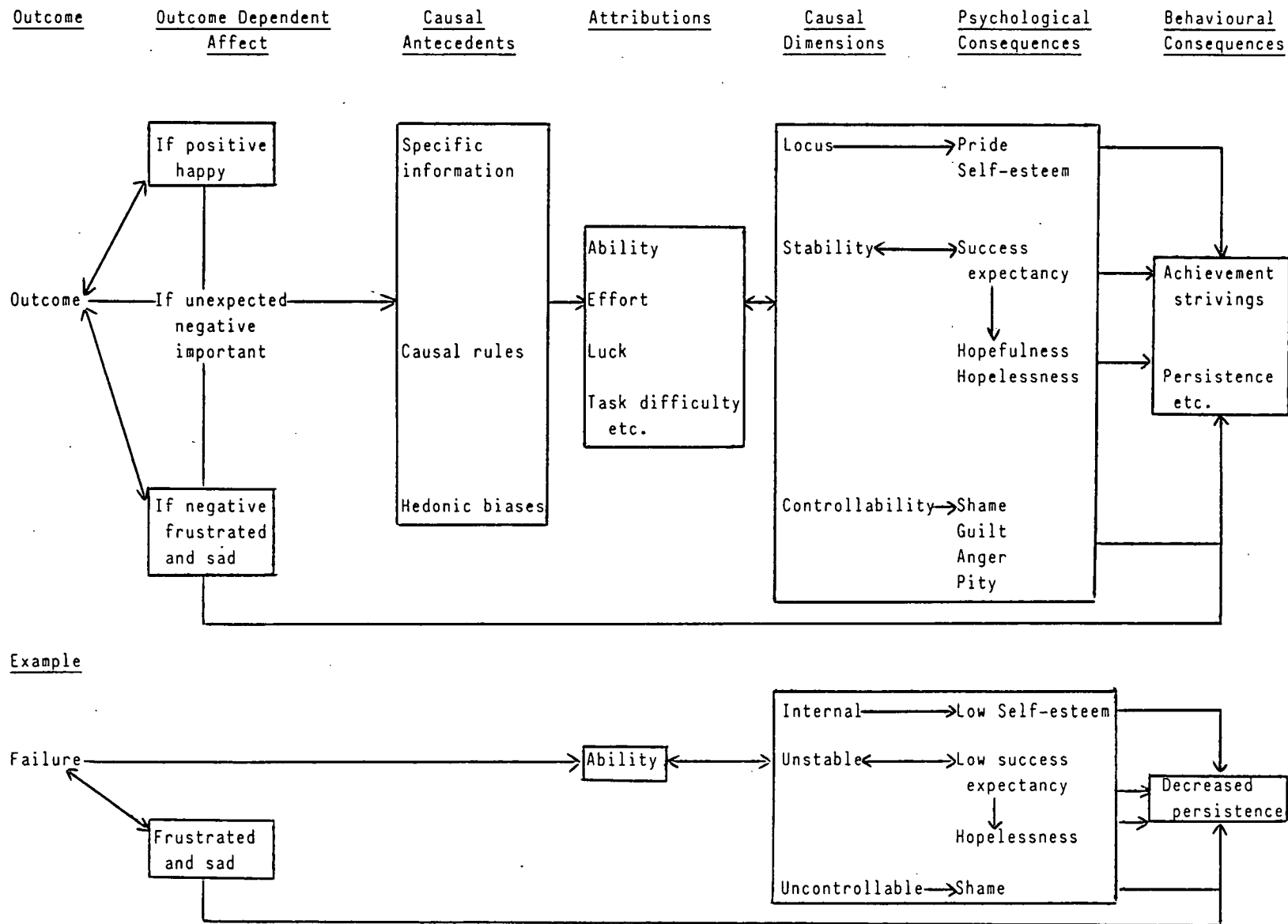


Figure 3.1 Weiner's attributional theory of motivation and emotion - based on a figure from Weiner (1988).

### Learned Helplessness Theory

Learned helplessness theory, originally developed by Seligman and his colleagues in the seventies (Seligman, 1972, 1973, 1974, 1975) grew from the discovery that dogs, exposed to unavoidable shocks, subsequently failed to escape avoidable shocks. In fact, they made no attempt to escape, but appeared to passively accept their situation. In contrast, naive dogs presented with the same situation soon learned the appropriate escape response.

This pattern of behaviour became known as the learned helplessness syndrome and the process underlying it, learned helplessness. The major symptoms of the syndrome are:

- (i) behavioural/motivational: reduced response initiation in an attempt to control outcomes (passivity)
- (ii) cognitive: difficulty in learning response - outcome contingencies;
- (iii) affective: anxiety and depression.

(Maier and Seligman, 1976)

At the root of learned helplessness is the animal's expectation or perception that the outcome in a particular situation is independent of its responses, i.e. that it cannot control the outcome. It is the expectation of uncontrollability or noncontingency which produces helplessness rather than noncontingency per se.



The debilitating consequences of uncontrollable events were first demonstrated in animal experimentation and were reported in dogs, cats, rats, fish and monkeys. (See Seligman, 1975, for a comprehensive review). Later studies produced similar findings in humans (e.g. Hiroto, 1974; Hiroto and Seligman, 1975; Miller and Seligman, 1975).

However, when applied to humans, this original theory met with major criticisms. Firstly, it was unable to distinguish between cases of uncontrollability in which no-one has control (universal helplessness), for example, leukaemia, and cases in which uncontrollability is restricted to one individual (personal helplessness), for example, repeated failures on a driving test (Bandura, 1977). Secondly, it was unable to specify the generality and chronicity of the symptoms of helplessness (Cole and Coyne, 1977; Roth and Bootzin, 1974; Wortman and Brehm, 1975).

To remedy these problems, Abramson, Seligman and Teasdale (1978) reformulated the original theory to include a cognitive component; attributions for noncontingency. In the revised version, the perception of noncontingency, is followed by a causal ascription. The ascription mediates expectations of future noncontingency and the expectations determine the generality, chronicity and type of helplessness symptoms. (Expectations can also be influenced

by vicarious experience, verbal persuasion and physiological state. However in the context of this thesis, causal explanations are most salient). Sharing many similarities with Weiner's taxonomy, the learned helplessness classification of attributions identifies three major dimensions:

- (i) internal-external,
- (ii) global-specific,
- (iii) stable-unstable.

Internal attributions are made when individuals believe that outcomes are more or less likely to happen to themselves than to relevant others. (Weiner's internal-external distinction refers to factors within and without the person, whereas Abramson et al (1978) use the self-other dichotomy. However, Abramson et al argue that Weiner, and earlier Heider and Kelly, similarly rely on social comparison as a major determinant of internality, rendering the two concepts essentially equivalent). Personal helplessness is assumed to be the consequence of internal attributions for noncontingency, and universal helplessness the consequence of external attributions. Cognitive and motivational deficits occur in both forms of helplessness because they are related to the expectation of further uncontrollability. Only personal helplessness has implications for a fourth consequence of human learned helplessness: self-esteem changes. When individuals believe

they are not in control of outcomes which are controllable for relevant others, their self-esteem suffers.

The global-specific dimension determines the generality of helplessness symptoms. A global attribution, (for example, ascribing repeated failure on driving tests to personal stupidity) gives rise to the expectation that in a new situation, the outcome will again be independent of responses; whereas a specific attribution (for example ascribing the same series of events to the difficulty of the driving tests) will not influence expectations of future outcome-response contingencies.

The stable-unstable dimension determines the chronicity of helplessness symptoms. Stable attributions (such as personal stupidity) give rise to chronic deficits and unstable attributions (such as bad luck) to transient deficits.

The common explanations for achievement outcomes are classified in the learned helplessness scheme thus:

- (i) ability - internal, global, stable
- (ii) effort - internal, specific, unstable
- (iii) task difficulty - external, specific, stable
- (iv) luck - external, global, unstable.

The reformulated model states that the intensity of motivational and cognitive deficits is subject to the strength of the expectation of future noncontingency, while the intensity of the self-esteem and other affective changes is dependent on the strength of the expectation and the importance of the event about which the individual feels helpless.

Learned helplessness theory has found application in a number of fields including the understanding of hospital patient behaviour (Peterson and Raps, 1984), the behaviour of the institutionalised aged (Langer and Rodin, 1976; Schulz, 1976), social behaviour (Goetz and Dweck, 1980), the effects of crowding (Rodin, 1976), coronary prone personality (Glass and Carver, 1980) and depression (see review by Brewin, 1985). However, one of the largest areas of research is intellectual achievement. This will now be considered.

#### Application of Learned Helplessness Theory to Intellectual Achievement

From learned helplessness theory it can be predicted that the experience of repeated failure on achievement tasks may lead some students to perceive response-outcome noncontingency, i.e. they may learn that their responses are incapable of producing success, that their exertions cannot lead to the desired outcome, and so become academically

helpless. This helplessness will be reflected in reduced motivation to initiate the responses which lead to success, and difficulty learning what these particular responses are. Should the students attribute their failures to an internal, stable and global factor such as lack of ability, then their helplessness will be maintained over time, generalise to tasks other than the task in which failure initially occurred and their self-esteem will decrease. The learned helplessness syndrome could thus account for impaired performances after failure. Such a response pattern has serious and long-term implications for attainment in that it limits the effective functioning of students confronted with obstacles or difficulties.

Dweck and her colleagues (Diener and Dweck, 1978; Diener and Dweck, 1980; Dweck, 1975; Dweck and Bush, 1976; Dweck, Davidson, Nelson and Enna, 1978; Dweck and Gilliard, 1975; Dweck, Goetz and Strauss, 1980; Dweck and Licht, 1980; Dweck and Repucci, 1973;) have been at the forefront of research to test these predictions.

In considering the responses of primary school students to failure, Dweck and Reppucci (1973) and Dweck (1975) distinguished two groups of children whose behaviour evinced learned helplessness and mastery-orientation. Upon encountering failure the learned helplessness group showed a decrease in effort expenditure, concentration, strategy

sophistication and persistence with a resultant deterioration in performance. The mastery-oriented group showed the opposite pattern of behaviour, increasing effort, concentration, strategy sophistication, persistence and performance. These two groups of children did not differ on intellectual ability or on the speed, accuracy or sophistication of strategies they used to solve problems prior to failure. However, they did differ in their explanations for failure. Helpless children tended to cite stable factors, especially a lack of ability (e.g. poor memory) or loss of ability (e.g. confusion), while the mastery-oriented group tended to cite unstable factors.

Having established this difference in attributional tendencies, Diener and Dweck (1978) focussed on related cognitions, which they investigated by asking subjects to verbalize their thoughts as they attempted to solve discrimination-learning problems. As the problems increased in difficulty and the children began encountering failure, the cognitions of the two groups began to diverge. The helpless children increased the number of task-irrelevant statements, expressed negative affect and a wish to withdraw from the situation, and spoke of their lack of ability as the cause of their difficulties. In contrast, the mastery-oriented children increased their task involvement and problem-solving orientation, increased the number of self-instructional and self-monitoring statements, expressed

positive affect and confidence in future success, and did not make attributions for failure. It appeared that while these children recognised that they had made mistakes, they did not acknowledge failure, and therefore did not need to explain it.

This difference in perceptions of success and failure was confirmed in a second study by Diener and Dweck (1980), which indicated that helpless children:

- (i) minimised successes relative to mastery-oriented children (they underestimated the number of problems they correctly solved, they attributed success to their own ability less often than mastery-oriented children, they predicted that others would do better than themselves even when they had performed to a high standard, and they predicted that they would perform poorly in the future on similar problems); and
- (ii) maximised failure (e.g. they overestimated the number of problems they had solved incorrectly).

Of particular interest was the finding that only 65% of the helpless group estimated that they could re-solve a problem if it were administered again and they had forgotten the answer, compared to 100% of the mastery-oriented group.

This series of studies identified a group of children who could be described as academically helpless: they believed outcomes were beyond their control in that they could not reliably repeat successes or surmount failures. This belief was mediated by their attributions for failure to lack of ability.

Most studies in this field have attempted to assess learned helplessness by inducing it in an experimental setting, i.e. by exposing subjects to varying amounts of helplessness training (varying proportions of failure to success trials) and then measuring cognitive indices (e.g. attributions and expectancies) and behavioural indices (e.g. persistence) said to reflect helplessness on a subsequent task. (e.g. Ames, Ames and Felker, 1977; Deaux and Farris, 1977). However, the learned helplessness construct has been given added validity by the identification of symptoms of helplessness in natural settings. Butkowsky and Willows (1980), for instance, found that amongst Grade 5 boys, poor readers showed more symptoms than their peers who were average or good readers. Even in the absence of specific helplessness training the poor readers were more likely to attribute failures to lack of ability and successes externally, had lower success expectancies and were less persistent in the face of difficulty.



Peterson and Barrett (1987) also considered the relationship between the 'real-life' academic performance of students and their attributional styles. They found that college freshmen who explained negative academic outcomes in terms of internal, stable and global factors were at risk for poor grades during their first year in college. Such an attributional style was associated with a lack of specificity in academic goals and a decreased search for academic advice. These in turn were associated with poor grades, even when the confounding effects of ability and depression were accounted for.

Although such findings as those of Butkowsky and Willows (1980) and Peterson and Barrett (1987) imply that the syndrome of learned helplessness occurs naturally, a note of caution must be sounded in applying the term learned helplessness too broadly. Because of methodological limitations, these studies do not clearly indicate that the performance deficits found are the result of perceived uncontrollability rather than stress, or alternative reactions to failure, for instance.

#### Implications for Change Programs

Weiner's theory of achievement motivation has important implications for the design of interventions to modify maladaptive behaviours, which are assumed to be mediated by particular attributions. In the achievement context, it

appears that some attributions are especially detrimental, particularly attributions for failure to lack of ability, which lead to reduced success expectancy, hopelessness, shame, and related emotions. These in turn mediate reduced persistence and performance. Thus, those students who construe failures as a consequence of lack of ability may do more poorly after failure than before on tasks of equal difficulty.

In considering the implications for change programs of learned helplessness theory, the overlap is immediately apparent. Attributions for noncontingency to lack of ability are again seen as the most maladaptive, giving rise to chronic and generalised helplessness with reduced self-esteem.

Attributional retraining programs endeavour to change this maladaptive attributional pattern and hence improve persistence in the face of failure by encouraging students to view failures as the result of lack of effort, poor strategy or temporary external barriers. Lack of effort is the most favoured alternative attribution. Traditionally, the expectancy shift associated with the instability of effort attributions, has been seen as the crucial element in the success of such retraining programs, in the same way that random reinforcement also increases resistance to extinction (Chapin and Dyck, 1976). However, the accompany

ing changes in affect may also have an important role to play. As noted previously, ability attributions for failure give rise to shame and effort attributions to guilt. It is possible that guilt is a more motivating emotion than shame, and there is some research to lend support to this proposal. Hoffman (1982) and Wicker, Payne and Morgan (1983) conclude that shame-related emotions give rise to withdrawal and motivational inhibition, whereas guilt-related emotions promote approach behaviour, retribution and motivational activation.

In the terms of learned helplessness theory, it can also be argued that encouraging students to view failures as the result of lack of effort may influence perceptions of uncontrollability. Effort attributions imply choice, and choice increases perceptions of control. Research on the importance of control in reducing stress indicates that subjects prefer instrumental control over an aversive event (such as a task which is estimated to be particularly difficult), that they are less aroused when waiting for a controllable event, and that controllable events hurt less (Miller, 1979); and that cognitive strategies implying that one can mitigate the aversiveness of an event actually reduce the aversiveness experienced (Thompson, 1981). Thus, believing that one can alter one's level of achievement and

avoid failure by altering effort expenditure may directly reduce feelings of uncontrollability and the associated stress.

## CHAPTER 4

### MOTIVATIONAL EXPLANATIONS OF IMPAIRED PERFORMANCES AFTER FAILURE

## CHAPTER 4

### MOTIVATIONAL EXPLANATIONS OF IMPAIRED PERFORMANCES AFTER FAILURE

The motivational approach to the attribution process emphasises the mediating influences of human needs, drives and emotions on the explanations individuals arrive at to account for events. In the achievement context, a particularly important motive is the need to protect or enhance self-esteem. It is possible to explain the detrimental effect of failure on performance by reference to the need for self-esteem protection, a proposal which will be developed in this chapter.

#### The Self-serving Bias in Attributional Style

A large body of research indicates that under certain conditions, attributions are asymmetrical, i.e. there is a tendency for individuals to take credit for successful outcomes (to attribute them to internal factors) and to deny blame for unsuccessful outcomes (to attribute them to external factors). (e.g. Arkin and Maruyama, 1979; Callaghan and Manstead, 1983; Covington and Omelich, 1978; Miller, 1976; Snyder, Stephan and Rosenfield, 1976;

Stephan, Rosenfield and Stephan, 1976. Also see reviews by Bradley, 1978; Weary, 1979; and Zuckerman, 1979.) In Zuckerman's review of 38 studies, for instance, 27 of these (71%) showed people taking more responsibility for success than failure; in only two studies was the reverse pattern evident. This asymmetry is variously known as the self-serving bias (Bradley, 1978; Weary, 1979), attributional egotism (Snyder, Stephan and Rosenfield, 1978), ego-defensive attributions (Miller, 1976) and ego-centric attributions (Schlenker and Miller, 1977). For the purpose of consistency within this thesis, the term self-serving bias, will be employed.

The self-serving bias is most frequently interpreted as the consequence of the desire or motivation to protect, maintain or enhance self-esteem (Bradley, 1978; Zuckerman, 1978). The self-esteem maintenance position has been developed to include such varied, but related theories, as self-worth theory (Beery 1975; Covington and Beery, 1976), excuse theory (Snyder, Higgins and Stucky, 1983), and egotism (Frankel and Snyder, 1978), all of which emphasise motivational factors in the attribution process.

The fundamental premise of self-worth theory is that individuals are primarily motivated to maintain the best possible opinion of themselves, a view put forward previously by Adler, 1956; Epstein, 1973; Festinger, 1954;

and Heider, 1944. Maximising successes and assuming personal responsibility for them is one way of enhancing this evaluative appraisal of self, or sense of self-worth. Avoiding failures or denying responsibility for them nullifies the threat to self-worth embodied in potential failure. The threat arises because of societal tendencies to equate worth with the ability to achieve and attain success.

This approach stresses that perceptions of ability are the basic ingredient in achievement motivation, and there is substantial evidence to support this view. Although achievement through effort is also an important source of esteem and worth, students would rather be seen as able and competent than motivated or industrious (Covington and Omelich, 1979b; Nicholls, 1976; Raviv, Bar-Tal, Raviv and Levit, 1983). In addition, ability is the dominant causal factor in performance (Covington and Omelich, 1979b), ability attributions account for most of the explained variation in shame after failure (Covington and Omelich, 1979b), and ability level is the major contributor to feelings of self-regard especially when seen as instrumental to subsequent achievement (Covington and Omelich, 1984). Perceiving oneself as incompetent produces frustration, anxiety and discouragement (Covington, 1986; Covington, Spratt and Omelich, 1980), whereas accepting credit for successes and denying responsibility for failure is



accompanied by positive affect (Nicholls, 1975; Reimer, 1975; Weary, 1980).

Furthermore, studies indicate that individuals are concerned to maintain and protect self-worth. Research on the use of self-handicapping strategies (e.g. Berglas and Jones, 1978; Jones and Berglas, 1978; Kolditz and Akin, 1982) shows that in evaluative situations some subjects will deliberately create an impediment to performance, such as electing to use alcohol, or exaggerating symptoms of anxiety or a physical injury, in order to provide a ready excuse for potential failure. In the Berglas and Jones (1978) study, male subjects who appeared to succeed on a particular task because of good fortune, then chose to use a performance-inhibiting drug during a second task. It seemed that when they felt uncertain of their ability to repeat the initial success, subjects chose a strategy which made the cause of the outcome on the second task ambiguous. The use of this strategy can be understood in terms of Kelly's (1971) discounting principle which states that the salience of a given cause of failure will be discounted and left vague if other plausible causes are available.

The use of self-protective strategies implies that emotional preferences influence cognitive processes. The notion that global affect takes primacy over cognitive processes has previously been proposed by Zajonc (1980).

Gollwitzer, Earle and Stephan (1982) more specifically suggest that outcome related affect mediates attributions. They propose that successes and failures result in a general positive or negative emotion which mediates attributions designed to protect or enhance self-esteem, and that these are then followed by more specific emotions arising from a cognitive labelling process. This model is in contrast to Weiner's (1972, 1979, 1985, 1988) in which it is suggested that a primitive emotion related to outcome does occur but is not linked to subsequent attributions. (See Chapter 3).

The self-serving bias in attributions is more frequently found under some conditions than others. A necessary condition is the individual's perception of a threat to self-worth. A failure is perceived as a threat when it is possible to attribute it to internal factors, (Federoff and Harvey, 1976; Stevens and Jones, 1976), and when it concerns a task in which the individual has ego-involvement, i.e. in which the outcome is important to, or valued by, the individual (Nicholls 1975; Snyder et al, 1978; Stephan and Gollwitzer, 1981). As the importance of the task increases, so does the tendency to engage in self-serving attributions (Miller, 1976).

Secondly, self-serving attributions are more likely when there is a real possibility that they will be successful in protecting or enhancing self-worth. This

depends in part on the plausibility of the particular causal explanation. Smith, Snyder and Handelsman (1982) found that when reports of anxiety were not accepted by the experimenter as an excuse for poor performance, then high test-anxious subjects switched to alternative self-protective strategies. When there are no plausible alternative explanations to that of incompetence, self-serving attributions are not used (Covington and Omelich, 1978). The success of self-serving attributions also depends on the likelihood of contradictions from other people or from subsequent performance, and they are therefore more likely to be used when outcomes are finalised and no further action can be taken (Schlenker, 1980; Snyder et al, 1978).

Thirdly, the self-serving bias is inhibited by conflicts with other motives such as the desire to be accurate, or to appear modest and co-operative (Snyder et al, 1978).

Finally, after reviewing attributional research, Bradley (1978) concluded that individuals are more likely to demonstrate the self-serving bias when they have a high level of objective self awareness, when they perceive a choice in their actions and therefore feel particularly responsible for the outcomes of them, and when their performances are public. Despite this last conclusion, there is some disagreement over whether attributional

asymmetry reflects biases in private perceptions of causality or distortions in public descriptions of them, or both (e.g. Arkin, Appleman and Burger, 1980; Reiss, Rosenfield, Melburg and Tedeschi, 1981; Snyder, 1985; Greenberg and Pyszczynski, 1985). Reiss et al, 1981, found that even when subjects thought that misrepresentations of their true feelings about causality could be monitored by lie detectors, a self-serving bias in their attributions was still marked. The authors concluded from this that individuals attempt to preserve an image of competence, and thus worth, to others and to themselves.

If this is so, then the need to protect self-worth appears to overlap with impression management strategies designed to gain public approval, avoid embarrassment and create a favourable impression on others (Orvis, Kelley and Butler, 1976).

#### Failure and Effort Expenditure

According to self-worth theory, there are a variety of ways to protect self-worth when faced with failure. In addition to denying blame by making external attributions for poor performance, it is also possible to alter achievement expectations or behaviour. For instance, raising aspiration levels and attempting very difficult tasks makes attributions to task difficulty plausible, while the outcome reveals little about the individual's level of

ability. A further option is the withdrawal of effort or the exertion of minimal effort. This strategy may involve such techniques as procrastination in the preparation of a manuscript, inattention in class or simply not trying particularly hard on a given task. Each of these will serve to deflect implications of low ability should failure occur.

Thus an explanation for impaired performance after failure may lie, not in the syndrome of learned helplessness, but in the deliberate withdrawal of effort after the perception of a threat to self-worth.

Effort and ability share a reciprocal relationship in explaining performance outcomes (Covington and Omelich, 1979a,b). It follows from this relationship that effort levels can be used as a cue to gauging ability levels, e.g. failure under conditions of maximum effort suggests low ability. It has been demonstrated that a combination of failure and high effort leads to suspicions of incompetence (Kun, 1977; Kun and Weiner, 1973). Furthermore, shame and dissatisfaction amongst college students appears to be greatest when they exert maximum effort yet still fail (Covington and Omelich, 1979b). The exertion of minimal effort acts to reduce the negative affect experienced after failure, and is clearly preferred by some students when they are faced with the prospect of failure (Covington, Spratt

and Omelich, 1980). The presence of other excuses to explain poor performance, or to account for the ineffectiveness of a high level of effort also serves to reduce negative affect (Covington and Omelich, 1979a; Mehlman and Snyder, 1985).

The preference for a low effort profile when self-worth is under threat may place students in something of a dilemma, since teachers prefer their students to exert maximum effort. Students who are perceived to have tried hard are rewarded more for success and punished less for failure by their teachers, than students who are perceived as not trying, irrespective of ability level. (Covington and Omelich, 1979b;; Rest, Nierenberg, Weiner and Heckhausen, 1973; Weiner, 1972, 1974; Weiner and Kukla, 1970). Thus, while teachers want students to try hard, under some conditions students may not want to do so. This conflict has led Covington and Omelich (1979a) to describe effort as the "double-edged sword" of school achievement, and to describe the plight of students as running the gauntlet between exerting insufficient effort and thus arousing the teacher's ire, and exerting so much effort that inability will be implicated should a failure occur and no alternative plausible explanations be available.

To summarise the self-worth perspective, failure produces a lowered self-estimate of ability under conditions

of high effort and the absence of other excuses to explain poor performance or the inefficiency of high effort. When these conditions are present, self-worth suffers, negative affect (particular shame) is experienced, success expectancies decrease and ultimately performance is effected. When failures are repeated this process appears to accelerate (Covington and Omelich, 1981). A priori strategies such as the withholding of effort, and defensive attributions which act to externalise blame, are therefore motivated to preserve self-worth and reduce shame.

#### Cognitive versus Motivational Explanations

The proposition of the motivational approach that attributions are influenced by the emotional and psychological needs of the individual contradicts the fundamental assumption of the cognitive approach that attributions are the result of rational information processing.

Although the existence of the self-serving bias superficially provides overwhelming support for the self-worth theory, Tetlock and Levi (1982) argue that most of the relevant studies are open to information-processing explanations. Miller and Ross (1975) previously argued that any of three cognitive variables could explain the bias:

- (i) individuals expect success more than failure and are more likely to make internal attributions for expected than unexpected outcomes
- (ii) the perceived covariation between responses and outcomes may be stronger for individuals experiencing a pattern of increasing success than for those experiencing constant failure
- (iii) people incorrectly judge the contingency between responses and outcomes in terms of the occurrence of the positive outcome rather than the actual degree of contingency.

A further simple but plausible possibility is that most people perceive themselves favourably and that this schema guides their attributions about performance (Tetlock and Levi, 1982).

Covington and Omelich (1978) tested the predictions of the cognitive approach by using path analysis to examine whether groups defined as high and low in achievement motivation differed in affective reactions, expectancy of future success and subsequent test performance as a consequence of attributions for a previous test outcome. The links predicted by the cognitive approach between attributions, affect, expectancy and performance were not found. With the exception of ability attributions,



subjects' explanations for failure accounted for little subsequent variation in affect, expectancy or performance. The authors interpreted these findings as indicative of the salience of perceptions of ability, and of the retrospective nature of attributions, i.e. they are reactions to past performance and have little bearing on subsequent performance.

Two further studies have reported only small relationships between attributions and expectancy change. McMahan (1973) found the correlations to be typically below .35. Palmer and Willson (1982) used path analysis to investigate the extent to which ability, effort, difficulty and luck enhanced the prediction of expectancies within an actual achievement situation for undergraduates. When attributions were included as a predictor variable in regression equations, it was found that only the stable factors (ability and difficulty) contributed significantly to the prediction of expectancy, but also that a mere .26% of the variance in expectancy was accounted for.

Furthermore, Forsyth and McMillan (1981), surveyed students after an exam and asked them to report on the outcome of the exam, the locus, controllability and stability of the perceived causes of their performance and their expectancies. They found that expectancies were related more to the perceived locus of the cause and to

controllability than stability. This supports social learning theory (Rotter, 1954) which in its examination of skill and chance tasks, emphasises the importance of locus in determining expectancy.

The proposed attribution-affect linkages have also been challenged. For instance, Palmer and Willson's study (cited above) showed that outcome information alone could account for self-esteem related affect, without reference to attributions. In addition the cognitive approach has been criticised for failing to take into account the role of task importance in determining affect (McMillan and Spratt, 1983), and for not adequately considering the possibility that attributions may be content-specific, i.e. specific attributions may be related to specific kinds of achievement (see Marsh, Cairns, Relich, Barnes and Debus, 1984).

Such criticisms have led to experimental attempts to distinguish between the cognitive and motivational approaches. A study by Frankel and Snyder (1978) was designed specifically to test alternative explanations of performance deficit on a new task after failure on a set of unsolvable problems. The manipulation of task difficulty levels was used to distinguish between learned helplessness and self-worth explanations. Previous studies indicate that describing a task as very difficult to subjects who are chronically worried about failing improves performance

(Feather, 1961, 1963; Karabenick and Youssef, 1968; Sarason, 1961). Frankel and Snyder thus reasoned that after being asked to complete a set of unsolvable problems subjects who were motivated to protect self-worth would perform better on a subsequent anagram task when that task was described as highly rather than moderately difficult. The highly difficult label provides an obvious excuse for failure (or mitigating circumstance), allowing for the exertion of effort without fear of failure implying incompetence. In contrast, learned helplessness theory predicts that subjects will perform more poorly when the task is described as highly difficult, because such a label will strengthen the expectation of noncontingency between response and outcome. The findings supported the self-worth predictions, and analysis of the anagrams solved in the first or second half of the 100 seconds allowed for each one, suggested that the improvement was due to enhanced persistence (i.e. more anagrams were solved in the second half of the time limit).

Snyder, Smoller, Strenta and Frankel (1981) conducted what was basically a replication of this study, although the mitigating circumstance was changed from high task difficulty to the presence of allegedly distracting music while anagrams were being completed. Again the results supported the self-worth predictions with subjects' performances improving when the music was present.

Stephan, Bernstein, Stephan and Davis (1979) conducted a study to compare the self-worth and expectancy confirmation explanations of the self-serving bias. The latter is a variation of the information-processing approach and suggests that outcomes which confirm expectancies will be attributed to the factors constituting the basis of the expectancy. For instance, assuming that in achievement situations people generally perceive themselves to have the capacity for success, then success will confirm this viewpoint and result in internal attributions. Failure will disconfirm the expectancy and lead to external attributions. Stephan et al (1979) manipulated expectancies by providing their subjects with information to imply that the experimental task was high or low in difficulty level, or that the subjects themselves were high or low in the ability required for successful achievement at the task. Outcomes were then varied to confirm or disconfirm these expectancies. The expectancy confirmation explanation predicts that failures which were expected because subjects were led to believe they were low in the requisite ability would be attributed more to the internal factor, ability, than to other factors; and, that successes which were expected because subjects were led to believe that the task was easy would be attributed more to the external factor, task difficulty, than to other factors. In contrast to this, but consistent with the self-worth approach, all successes whether confirmed or otherwise tended to be

attributed internally and failures to be attributed externally. This finding was supported by the results of a field study conducted by the same authors (Stephan et al, 1979) in which college students who performed well in their exams attributed their outcomes more to the internal factors of ability and effort and less to external factors than did students who performed poorly.

In a further test of the self-worth versus expectancy confirmation explanations, Chapman and Lawes (1984) concluded that attributions were influenced by both expectancy confirmation and the valence of the outcome, with neither model having causal predominance.

Finally, Strube (1985) considered the attributional styles of Type A and Type B individuals. Past research suggests that Type A's show greater performance deficits than Type B's after exposure to extended, salient uncontrollable stimuli (Glass and Carver, 1980). Learned helplessness theory predicts that the performance deficits will be accompanied by internal, stable and global attributions for failure, and external, unstable and specific attributions for success. However, it is possible to argue from the self-worth perspective that since Type A's are concerned with striving for achievement, they will also be concerned with protecting and enhancing perceptions of ability and will therefore be more likely to display the

self-serving bias than Type B's. In other words, they will tend to make more internal attributions for success and external attributions for failures. Strube tested these predictions by examining the relationship between indices of attributional style (measured by the Attributional Style Questionnaire) and Type A behaviour (measured by the Jenkins Activity Survey). All subjects were found to display the self-serving bias, though it was more marked for Type A subjects.

The weight of the scant evidence to date tends to support motivational explanations of the attribution process over a purely information-processing perspective. However, any consideration of theories which can explain impaired performance after failure must take into account the influences of individual differences. These will be discussed in the next chapter.

#### Implications for Change Programs

The interest in distinguishing between the cognitive and motivational theories is not purely theoretical, since important implications for therapeutic intervention arise from each. To reiterate the conclusion from the previous chapter, the cognitive approach suggests that subjects whose performance deteriorates after failure will benefit from attributional retraining programs designed to encourage them to ascribe failures to a lack of effort. But from the self-

worth perspective, such an intervention may clearly be inappropriate since it asks students to engage in the sort of behaviour which leaves them most open to the criticism of incompetence should failure still occur. Suggested (though untested) techniques for dealing with students who withdraw effort in order to protect self-worth include (i) encouraging a sense of worth which is not contingent on ability (Covington and Beery, 1976), (ii) viewing learning as a process which involves individual goalsetting using realistic, manageable goals and the application of such skills as task analysis and strategic self-management (the recognition of strengths and weaknesses and the husbanding of time and energy relative to task demands and personal aspirations) (Covington, 1983), and (iii) encouraging the use of appropriate attributions so pupils can "diagnose" when they have succeeded due to ability or prior learning, when extra effort will lead to success, and when task difficulty is such that effort alone will not bring about any significant achievement (Butler, 1986).

## CHAPTER 5

### INDIVIDUAL DIFFERENCES



## CHAPTER 5

### INDIVIDUAL DIFFERENCES

The cognitive and motivational theories thus far discussed have been criticised for failing to take into account the influences of individual variables, although the available evidence indicates that these are critical in any consideration of attributional style and predisposition to learned helplessness or self-worth protection. Individual differences have largely been ignored because of the tendency of attribution research to concentrate on situational manipulations which produce systematic differences generalizing across situations.

In this chapter, the influences of age, sex, self-esteem and achievement history will be considered.

#### Age

Attributions and attributional dimensions employed in the explanations of achievement outcomes vary with the age of the attributor. Most of the variance occurs in the 5 to

12 year old age range (Karabenick and Heller, 1976; Nicholls, 1978, 1979).

Developmental patterns depend in part on the capacity of children to accurately distinguish between effort and ability and to understand their relative contributions to outcome. Karabenick and Heller (1976) maintain that children in Grade 1 have some limited appreciation of the inverse relationship between effort and ability, that the capacity to infer effort from ability and outcome information develops some time after this, and that the capacity to make ability attributions from effort and outcome information develops later still (about Grade 5 or age 10). In line with this are studies which show that children younger than 9 or 10 years old are inconsistent in their use of effort and ability attributions (e.g. Nicholls, 1978).

Further, younger children are unable to accurately perceive their own attainment relative to others. For instance, they tend to overestimate their performance (Nicholls, 1978). This means that past performance cannot influence attributions in the manner prescribed by the attributional model. This is supported by a series of studies of attributional patterns in 6 to 12 year olds. Nicholls (1975, 1978, 1979) found that at the younger age levels, the relationship between attributions and perceived

attainment was insignificant, but as children grew older, a clear relationship developed.

Finally, younger children maintain higher success expectancies after failure than older children (Parsons and Ruble, 1977). They do not seem to view failure and perceptions of inability as implying stable limitations on performances.

In summary, it appears that attributions cannot be consistently used by children until about age 10. Therefore, one would not expect younger children to be as susceptible to helplessness induction as older children. Rholes, Blackwell, Jordon and Walters (1980) compared subjects from Kindergarten, Grade 1, Grade 3 and Grade 5 to test this hypothesis. Subjects were made to succeed or fail on a hidden figures task. Only Grade 5 children developed symptoms of helplessness (i.e. reduced persistence and performance after repeated failure). It is possible however, that this finding may simply represent a developmental difference in responses to success and failure outcomes. The methodology does not allow for the unequivocal conclusion that the performance deficits of the Grade 5 subjects were the results of helplessness, and exposure to noncontingency.

The relative value placed on achievement through effort and achievement through ability also varies with age. Raviv et al (1983) examined developmental trends amongst Grade 5, Grade 10 and college students and found that the Grade 5 subjects appreciated and valued effort more than ability, and more than the two older groups. They believed that effort more than ability raised the grades given by their teachers, and achievement through effort gave them more satisfaction than achievement through ability. The two older groups clearly preferred ability to effort, a finding which is consistent with the Covington and Omelich studies cited in the previous chapter, all of which used college students as subjects. It is also consistent with other studies indicating that over the age of 12, effort is devalued, while ability and outcome increase in value (Harari and Covington, 1981; Weiner and Peter, 1973). Raviv et al suggest that between the ages of 10 and 12 (approximately), students are still influenced by their teachers' value systems which emphasise trying hard, regardless of ability level.

Contradictory findings regarding affective responses to failure when effort is low may be due to the confounding effect of age. In studies of primary school children, a combination of failure and low effort gave rise to shame (eg. Nicholls, 1975, 1976). It is possible that children valued effort highly and responded according to their

internalisation of the teacher's value system. However, in studies using college students, the combination of failure and low effort was associated with guilt (eg. Covington and Omelich, 1984).

### Sex

A large body of evidence indicates that males and females differ in their perceptions of personal competence from an early age. With regard to attributional style, in general females tend to cite external factors more than males (e.g. Bar-Tal and Frieze, 1977; Deaux and Farris, 1977; Feather, 1969; Frieze and Bar-Tal, 1980; Simon and Feather, 1973), and to make internal and stable attributions for failure and external and unstable attributions for success. Males show the reverse pattern. More specifically, females blame lack of ability for failure (Dweck and Reppucci, 1973; Covington and Omelich, 1979a; Nicholls, 1975, 1979; Bar-Tal, 1978; Dweck and Bush 1976; Dweck et al, 1978) whereas males blame lack of effort (Dweck and Reppucci, 1973) or bad luck (Nicholls, 1975) and are more likely to cite ability as the reason for their successes (Nicholls, 1975).

Females also have lower success expectancies (Crandall, 1969; Dweck and Reppucci, 1973; Nicholls, 1973; Montanelli and Hill, 1969) and are more likely to avoid tasks which test skill or situations in which failure is

likely (e.g. Butterfield, 1964; Crandall and Rabson, 1960). As expectancies and attributions are purported to be the mediators of learned helplessness, one would predict females to be more vulnerable to the syndrome and this has been borne out in research (Dweck and Gilliard, 1975; Dweck and Reppucci, 1973; Gody, 1978; Le Unes, Nation and Turley, 1980; Maccoby, 1966; Nicholls, 1975; Veroff, 1969; Welch and Huston, 1982; Wilson, Seybert and Craft, 1980). In addition there is some evidence that girls are more likely to generalise helplessness to new situations. In both experimental and field settings, Dweck et al, 1980 found that situational changes such as a new task, teacher or evaluator was followed by less recovery in success expectancies for girls than boys, possibly because their attributions for failure (lack of ability) were global in nature.

Sex differences in expectancies, attributional style and vulnerability to learned helplessness have been proposed as possible explanations for the predominance of clinical depression amongst women (Abramson et al, 1978).

The tendency of females to lower estimates of competence relative to males occurs even when females perform as well or better than males (see Eccles, [Parsons], Adler and Meece, 1984) and are more favourably rated by teachers (see Dweck et al, 1978). Both Crandall (1978) and

Dweck et al (1978) argue that the sex differences in persistence and attributions are derived largely from the type of feedback given by primary school teachers. Classroom observations led them to conclude that since boys receive a greater proportion and a more indiscriminant application of negative feedback, they are discouraged from viewing failure as indicative of low ability. In contrast, the focus of feedback on intellectual aspects of girls' work encourages them to attribute failures to inability.

Studies which have failed to find sex differences in expectancies, attributions and vulnerability to learned helplessness are fewer in number (e.g. Stipek and Hoffman, 1980; Parsons, 1983).

The sex-typing of the subject in which performance is evaluated is an important factor in this context. Whether the subject or task is considered to be masculine or feminine in orientation may be critical in determining the presence of sex differences. It is known that subjects achieve more when their task is perceived to be sex-appropriate (Etaugh and Brown, 1975; Feather and Simon, 1975) and has greater subjective value (Eccles et al, 1984). Attributional style also appears to be influenced by the subjective value of the task. Miller (1976) found that when subjects failed a task in which they had a high level of ego-involvement they attributed the outcome more to bad luck

and less to lack of ability and effort than their peers who had a low level of ego-involvement. Similarly, Karniol (1987) found that students who failed a subject which they liked very much made more test-specific (unstable) attributions, thus allowing them to believe in the possibility of future success. One would therefore expect more girls to exhibit learned helplessness in a male stereotyped subject such as mathematics, than boys. Dweck and Licht (1980) argue further that the features of mathematics tasks lend themselves to learned helplessness, or would be most debilitating and least attractive for helplessness-prone individuals. In mathematics (as compared to reading, for instance)

- (i) there is a greater probability of failure,
- (ii) failures are more salient because answers are clearly right or wrong,
- (iii) there is little opportunity to compensate for perceived inadequacies (even neatly written sums which are incorrect will still be marked so),
- (iv) negative feedback is perceived as reflecting on ability (because performance is compared to an objective criteria and because feedback is more likely to be related to intellectual aspects of the task), and finally
- (v) the behaviour required for success in mathematics, enhanced problem-solving sophistication upon



encountering initial failure, is particularly disrupted by learned helplessness

Although these hypotheses have some face validity, it is as yet not clear whether either the male stereotyping of mathematics and/or the particular features of the subject do contribute to the considerable sex differences noted in mathematics versus verbal achievement, and the fact that fewer women study advanced mathematics and enter mathematics careers (Meece, Parsons, Kaczala, Goff and Futterman, 1982).

Self-worth theorists have interpreted the greater tendency of males to attribute successes to ability, and of females to attribute failures to inability, as the consequence of males' need to sustain an image of competency (Covington and Omelich, 1979a; Covington et al, 1980). There is evidence that males do indeed find high ability descriptions more desirable than females (Zander, Fuller and Armstrong, 1972), and low ability descriptions more distressing (Covington et al, 1980); and that males attributional style is much more prone to reflect self-serving biases (e.g. Berglas and Jones, 1978; Feather and Simon, 1973; Nicholls, 1975; Snyder et al, 1976; Stephan et al, 1976; Streufert and Streufert, 1969; Wolosin, Sherman and Till, 1973).

### Self-Esteem

Cognitive theories predict that attributing outcomes internally will be accompanied by self-esteem changes. In particular, they predict that citing internal factors as the cause of failure will produce a lowering of self-esteem, whereas citing external factors will not affect self-esteem.

However, it seems likely that in reality the interaction between attributions and self-esteem is more complex and circular. Failing students who blame themselves for their lack of ability will lower their expectations for future success, thus increasing the possibility of poor future performance. This level of performance will then contribute to low self-esteem, in turn predisposing the student to further inability attributions and creating a self-perpetuating cycle. In other words, making internal attributions for failure will reduce self-esteem, and low self-esteem will make further internal attributions for failure likely. The evidence confirms that low self-esteem individuals do tend to make internal attributions for failure and external for success (Brewin and Furnham, 1986; Brewin and Shapiro, 1985; Buss and Scheier, 1976) while high self-esteem individuals tend to externalize failures and internalise successes (Fitch, 1970; Ickes and Layden, 1978; Marsh et al, 1984; Zautra, Guenther and Chartier, 1985).

In addition, low self-esteem subjects appear to be more affected by repeated failure than their more confident peers. Covington and Omelich (1981) noted that after an initial failure, low self-esteem subjects experienced greater shame and expectancy decrements than high self-esteem subjects, and that after a further failure their doubts increased to a greater extent than those of their peers. It is therefore not surprising that learned helplessness induction procedures have a more marked effect on low self-esteem subjects (Brockner, 1979, a, b); and that self-esteem is positively associated with persistence at difficult tasks (Shrauger and Sorman, 1977) and effort expenditure generally (Digory, Klein and Cohen 1964; Felson, 1984).

Two contradictory predictions can be derived from the motivational approach. While the aforementioned tendency for high self-esteem subjects to externalize failures and internalize successes indicates that self-esteem is positively associated with the self-serving attributional bias, it is also possible to argue that because the least confident individuals suffer the greatest shame and distress in failure (Covington and Omelich, 1981) they will be highly motivated to engage in self-protective behaviour in order to reduce shame. These predictions have yet to be adequately tested.

### Achievement History

The cognitive model implies that students who consistently perform at a relatively low level will begin to attribute their past failures to a stable factor and will lower their expectations of future success, which in turn will increase the likelihood of continued failure (thereby fulfilling the prophesy). This proposal is consistent with evidence linking the attributions and achievement behaviour of mentally-retarded and learning disabled children. Such children have low success expectancies even for tasks at which they are no less able to succeed than high-achieving children (Gruen and Zigler, 1968); they tend to attribute failure stably, particularly to lack of ability (Bryan and Bryan, 1981; Chan and Keogh, 1974; Macmillan and Keogh, 1970; Stipek and Hoffman, 1980), to place less emphasis on effort as a cause of success (Scott and Moore, 1980), and to attribute success externally (Chapman and Boersma, 1979).

Weisz (1979) found retarded children to be more helpless than non-retarded children in terms of persistence after failure, response initiation and attributions for failure, although the difference was more marked at upper Mental Age levels. Weisz took this to indicate that retarded children learn their helplessness over their years of schooling as they repeatedly fail to obtain desired achievements. A second study (Weisz, 1981) implicated teacher feedback as a crucial variable in increasing the

retarded child's susceptibility to learned helplessness. It showed that when a child was labelled as retarded, adults were less likely to urge him or her to persist when encountering difficulties. However, a more recent study by Kistner, Osborne and Le Verrier (1988) has found that over a two year period the developmental changes in attributions of learning-disabled children were the same as those of their peers who had no learning disability. Rather than supporting the notion that learning-disabled children enter a self-perpetuating failure cycle, the authors propose that their cognitive abilities develop in the same sequence, but at a slower rate than those of other children.

With regard to the motivational approach, little research has been done relating defensive attributions and strategies to intellectual level or achievement. Some studies indicate that low achieving children exhibit a self-deprecating rather than self-serving bias in attributions (e.g. Chapman and Boersma, 1979). In general the studies are so scant as to preclude the drawing of meaningful conclusions.

### Conclusion

It is clear from the research reviewed in this chapter that individual differences have a considerable influence on achievement behaviour, and it seems logical to assume that

both situational and individual factors contribute to responses to failure. Their relative contributions are as yet undefined, although there is evidence that chronic attributional style can, in some cases, be overridden by situational factors (Alloy, 1982; Miller and Seligman, 1982). Consideration of individual factors gives rise to the following conclusions:

#### Age

- (i) A minimum age of 10 is required to ensure effective learned helplessness induction.
- (ii) Effort attribution retraining will be most effective for students in the 10 to 12 year age group, since it is consistent with their own and teachers' values.

#### Sex

- (i) Learned helplessness theory predicts that after a series of failures more girls than boys will show impaired performance, because of their greater tendency to blame inability.
- (ii) Self-worth theory predicts firstly, that after a series of failures more boys than girls will show impaired performance because of their greater need for self-protection; and secondly, that the pattern of impaired performance will not respond

to attribution retraining which in its emphasis on effort presents a further threat to self-worth.

#### Self-esteem

- (i) The effects of learned helplessness induction will be most marked with low self-esteem subjects.
- (ii) The association between self-protective behaviour and self-esteem is unclear.

#### Academic History

- (i) Low achieving/low IQ subjects may be more prone to naturally occurring learned helplessness, although it is not clear whether they will be more vulnerable to helplessness induction procedures.
- (ii) The association between self-protective behaviour and level of achievement or IQ is unclear.

## CHAPTER 6

### ATTRIBUTIONAL RETRAINING PROGRAMS



## CHAPTER 6

### ATTRIBUTIONAL RETRAINING PROGRAMS

Developments in attributional theories of human behaviour have precipitated attempts to initiate behaviour change using attributional principles. In the area of achievement, particular emphasis has been placed on modifying maladaptive responses to failure. In this chapter, attributional retraining programs are reviewed.

As noted in Chapter 3, individuals with different attributional styles tend to perform differently on achievement-related tasks. Both Weiner's theory of achievement motivation and learned helplessness theory assume that maladaptive behaviours, such as impaired performance after failure, are mediated by particular attributions and can therefore be treated by the modification of those attributions. In particular, attributing failure to lack of ability gives rise to reductions in success expectancy and self-esteem, and negative affect such as shame, with the eventual outcome being a deterioration in the level of performance. Interventions designed to alter this pattern via attributional retraining usually involve:

- (i) altering attributions for failure to external factors such as bad luck, which do not have implications for self-esteem,
  - (ii) altering attributions for failure to unstable factors such as inappropriate or insufficient effort, which do not have implications for success expectancy, sustain hopefulness about future outcomes and arouse feelings of guilt rather than shame.
- OR (iii) altering attributions for success to internal factors such as effort or ability, which strengthen self-esteem.

Bandura's self-efficacy theory (Bandura, 1977, 1982) also provides a basis for attributional retraining. According to self-efficacy theory, people's behaviour is determined by their feelings of efficacy in coping with a particular situation. Perceptions of self-efficacy influence people's choice of activities, effort expenditure and persistence when faced with difficulties: the higher the level of perceived efficacy, the greater is the involvement in activities and subsequent achievement. It follows that experiences which increase self-efficacy will also exert a favourable influence on persistence and performance. From the perspective of self-efficacy theory, attributions mediate behaviour because they convey efficacy information. For instance, construing a success as the

result of personal ability or hard work conveys to the attributor that he has the efficaciousness to achieve, and this reinforces a sense of efficacy. Attributional retraining programs are a means of conveying such efficacy information.

### A Review of Attributional Retraining Studies

Table 6.1 contains a summary of the important aspects of attributional retraining studies, including the nature of subject selection, the problem areas addressed, the techniques used to initiate change, and the effects of these on dependent variables. (See Försterling, 1985, for a comprehensive review.)

#### Subject Selection

The majority of studies used as subjects children of primary school age (Grades 3 to 7). There were four exceptions. Wilson and Linville (1982, 1985) used college freshmen, while Zoeller, Mahoney and Weiner (1983) worked with mentally retarded adults. The youngest subjects (Grades 1 and 2) were used by Zimmerman and Ringle (1981). Initially, this appears to be an inappropriate population since it is not until aged about 9 or 10 that children develop consistency in their use of attributions to explain outcomes (See Chapter 5). However, in the Zimmerman and Ringle study, the authors described their intervention as verbal modelling or statements of confidence. Although the

TABLE 6.1

A summary of attributional retraining studies

STUDY	SUBJECT SELECTION	PROBLEM AREA	INTERVENTION	RESULTS
Anderson (1983)	63 college students selected on the basis of attributional style for interpersonal failure, measured by the Attributional Style Assessment Test (Anderson et al, 1983)	Interpersonal persuasion task	In a single session, subjects were encouraged to construe success as the result of correct strategy. (i.e, appropriate effort)	Increased expectancies, improved motivation and performance
Andrews & Debus (1978)	42 Grade 6 boys, identified on basis of attribution for failure on a Circle Design Task (infrequent attribution to lack of effort),	Block Design Circle Design Anagrams	In a single session of up to 60 trials, subjects worked on Block Design tasks, and were asked to make attributions for the outcome of each trial. All effort attributions were reinforced with verbal praise or with verbal praise and tokens.	Both conditions led to (i) increased persistence on a Block Design task, and 2 transfer tasks (Circle Design and Anagrams) immediately, 7-9 days, and 4 months after the intervention, (ii) increased effort attributions, but no significant change in Intellectual Achievement Responsibility Scale (IARS) scores.
Chapin & Oyck (1976)	30 children from Grades 5, 6 & 7 reading below grade level,	Reading	In three sessions, of 15 trials each, students were given effort attributional feedback for successes and failures while reading aloud difficult sentences.	Improved persistence (increase in the number of sentences containing a difficult word read voluntarily).
Cullen & Boersma (1982)	60 Grade 4 boys 30 identified as learning disabled (LD) with a deficiency in reading/language and the remainder normal achievers	Sequential problem-solving	In a single session, students received either tutor assistance or self-instructional training in sequential problem-solving, accompanied by feedback designed to induce success at coping with failure by encouraging internal attributions for outcomes, e.g. "Good, you've found a way to work out the sequence."	For LD children, tutor assistance, plus attributional feedback was effective in minimising the effects of failure (i.e, increased the number of tangram puzzles correctly solved and reduced the number on which students gave up) and encouraging continuing motivation (i.e, electing to complete an optional task). For normal children, both conditions were effective in minimising the effects of failure.

STUDY	SUBJECT SELECTION	PROBLEM AREA	INTERVENTION	RESULTS
Dweck (1975)	12 children (8 - 13 years old) with extreme reactions to failure, identified by teachers on a helplessness rating scale	Arithmetic	Over 25 days, children worked on arithmetic problems in which 2-3 failures were scheduled per session. When failures occurred, children received effort attributional feedback.	Improved persistence and performance (number of correct arithmetic problems after failure). Increase in effort attributions.
Fowler & Peterson (1981)	28 Grade 4, 5 & 6 children reading below grade level, and identified as "helpless" on the basis of responses to IARS and an Effort vs. Ability Failure Attribution scale for reading	Reading	In three sessions, students either received effort attributional feedback for successes and failures while reading aloud difficult sentences, or listened to a recording of the above and practised similar self-statements, e.g. "I got that right. That means I tried hard."	Increased persistence (number of sentences read aloud). The self-statement condition resulted in an increase in effort attributions.
Gatting-Stiller, Gerling, Stiller, Voss & Wender (1979)	Grade 5 & 6 children low in achievement motivation	Intelligence test tasks.	In a single session, subjects observed on film a model attributing failure to lack of effort, and persisting after failure in the completion of a maze task.	Increased effort attributions on training task (but not transfer task). No significant effect on persistence and general attributions.
Gerling, Petry-Sheldrick & Wender (198)	96 Grade 5 & 6 children low in achievement motivation	Maze Task	As above	Increased persistence (number of attempts to solve maze). Persistence was further increased when the intervention included modelling of high success expectancies and to a lesser extent positive affect.
Medway & Venino (1982)	40 Grade 4 & 5 children identified by IAR subscale as low in effort preference	Visual discrimination problems	A single session in which students attempted visual discrimination problems. At the completion of each problem, E gave attributional feedback linking outcome, either success or failure, to effort. Outcome was manipulated so that half of the students experienced an ascending pattern of successes over trials and the remainder a random pattern.	Attributional feedback resulted in increased persistence on discrimination tasks, but did not influence attributions. Patterns of success had no significant effect.

Schunk (1981)	56 9 - 11 year old children identified by teachers as low in arithmetic achievement, persistence and self-confidence.	Arithmetic	In three 55 minute sessions, E gave attributional feedback designed to encourage subjects to view failures as due to lack of effort (eg "You need to work harder") and successes as result of effort (eg "You worked really hard on that one"). Feedback was given on average about 20 times during the intervention.	No significant affect on arithmetic achievement, persistence or self-efficacy.
Schunk (1982)	40 7-10 year old children identified by teachers as lacking subtraction skills.	Arithmetic	In three 40 minute sessions, children were given didactic training in subtraction operations accompanied, on average, every 8 minutes by either: (1) past effort attributional feedback eg "You've been working hard" (11) future effort attributional feedback eg, "You need to work hard".	Past effort attributional training led to more rapid mastery of subtraction operations and greater skill development, though did not influence level of persistence, future effort attributional retraining had no significant effect.
Schunk (1983)	44 Grade 3 children identified by teachers as deficient in subtraction skills	Arithmetic	In three 40 minute sessions children were given instruction in and practice with subtraction operations, accompanied, on average, every 8 minutes by either: (1) ability attributional feedback, eg, "You're good at this". (11) past effort attributional feedback- (111) ability + past effort attributional feedback.	All conditions led to improved speed of problem-solving, increased performance on subtraction tasks, and increased self-efficacy. There was no significant effect on persistence. Ability feedback was more effective than the other two conditions.

STUDY SUBJECT SELECTION PROBLEM AREA INTERVENTION RESULTS

STUDY	SUBJECT SELECTION	PROBLEM AREA	INTERVENTION	RESULTS
Schunk (1984)	8-10 year old children identified by teachers as deficient in subtraction skills.	Arithmetic	In four 40 minute sessions children were given instruction and practice with subtraction operations, accompanied, on average, every 8 minutes, by either: (1) ability attribution, in which ability feedback was given initially, were most effective.	All conditions led to increased performance on subtraction tasks, increased self-efficacy and more ability attributions, but conditions (1) and (11) in which ability feedback was given initially, were most effective.
Short & Ryan (1984)	56 Grade 4 boys, 14 were skilled readers and 42 had poor reading skills.	Reading	Initially, explanations of the importance of effort in successful reading were given. Over three sessions, E reminded subjects of this and continuously prompted them to recite such self-statements as "Praise yourself for a job well done; try hard."	No significant effect on reading performance. The intervention only minimally assisted strategy training in improving reading.
Wilson & Linville (1982)	40 college freshmen selected according to self-reported dissatisfaction with college, low performance and worry about performance.	Academic grades	A single session showing a video interview supported by statistics, conveying the information that many freshmen experience academic problems, but improve in later years (designed to encourage unstable attributions for failure)	(1) Improved performance. - better performance on Graduate Record Exam items immediately and 1 week after intervention. - improved Grade Point Average in the year after intervention. (11) Improved persistence - reduction in percentage of student dropouts (111) Improved success expectancy - with regard to Grade Point Average in the long term, not immediate future.
Wilson & Linville (1985) (replication of their 1982 study)	80 college freshmen selected as above	As above	As above	As above

STUDY	SUBJECT SELECTION	PROBLEM AREA	INTERVENTION	RESULTS
Zimmerman & Ringle (1981)	100 Grade 1 & 2 children of black and Hispanic origin from a lower-class school.	Puzzle problem solutions	In single, individual sessions, subjects observed an adult male model attempting to solve 2 wire puzzles. The model displayed either high persistence (5 minutes) or low persistence (30 seconds) and verbalised state-of confidence, eg. "I am sure I can separate these wires; I just have to keep trying different ways, and then I will find the right one." (Though the authors did not make this explicit, such statements are a form of effort attributional re-training.)	The modelling of highly persistent behaviour resulted in increased self-efficacy estimates, and increased persistence (in attempts to solve a wire puzzle). The increased persistence generalized to an embedded word puzzle 1 day later. However, statements of confidence were 7 times more influential on persistence than the model's duration of performance.
Zoeller, Mahoney & Weiner (1983)	36 mildly to moderately mentally retarded adults identified by their supervisors as having motivational problems, and exhibiting decreased motor performance after failure on an assembly task.	Assembly Task	In 5 fifteen minute sessions, subjects either: (i) viewed on film a peer being given attributional feedback relating successes to ability and effort, and failures to lack of effort (modelling) or (ii) received in vivo feedback individually.	Both conditions led to improvement in performance after failure (time taken to complete a bolt-board assembly task). However, the modelling condition was slightly more effective than individual feedback.



technique essentially constituted an attributional retraining procedure, it was not conducted from this standpoint.

Subjects tended to be selected on the basis of a particular cognitive set, such as attributional style or level of achievement motivation; or standard of performance, such as performance decrement after failure, reading below grade level, or teacher rating of helplessness. In some studies, both indices were used for selection. For instance, Fowler and Peterson (1981) identified an initial pool of 79 children who had been assessed as reading below their grade level. From these, 28 children were selected on the basis of their responses to the Intellectual Achievement Responsibility Scale, and a 5 item Effort versus Ability Failure Attribution scale for reading, which indicated that they tended to ignore the role of effort in explaining academic outcomes. By such procedures, researchers attempted to identify the populations that would most benefit from interventions based on attributional principles.

#### Problem Area

Because the majority of studies have been generated by Weiner's model of achievement motivation, intellectual tasks predominate as target problem areas. These generally fall into one of two categories: purely academic subjects, such as reading or arithmetic; and other tests of intellectual

ability such as sequential problem-solving, maze tasks and puzzle solutions. In addition, Medway and Venino (1982) presented their subjects with visual discrimination problems; Zoeller et al, (1983) used an assembly task which was relevant to the employment of their mentally retarded subjects; and Anderson (1983) used an interpersonal persuasion task which required subjects to telephone fellow students and persuade them to donate blood. The studies conducted by Wilson and Linville (1982, 1985) are unique in that they targeted actual academic performance: they measured the effect of their intervention on Grade Point Averages, and student dropout rates.

#### Intervention

There is considerable variability amongst the techniques used to initiate change, making comparisons of effectiveness difficult.

Attributional styles which subjects were encouraged to adopt include:

- (i) attributing success to effort (Anderson, 1983, Short and Ryan, 1984)
- (ii) attributing success and failure to effort (Andrews and Debus, 1978; Chapin and Dyck, 1976; Fowler and Peterson, 1981; Medway and Venino, 1981; Schunk, 1981, 1982).

- (iii) attributing success and failure to internal factors (Cullen and Boersma, 1982)
- (iv) attributing failure to effort (Dweck, 1975; Gattling-Stiller, Gerling, Stiller, Voss and Wender, 1979; Gerling, Petry-Sheldrick and Wender, 1981).
- (v) attributing success to ability (Schunk, 1983).
- (vi) attributing failure to unstable factors (Wilson and Linville, 1982; 1985)
- (vii) attributing successes to internal factors and failure to effort (Zoeller et al, 1983)

The most commonly used technique of encouraging attributional change in the desired direction is persuasion: subjects are told that a certain cause is responsible for a particular outcome, and are then given the opportunity to engage in a training task. While thus engaged, they are given feedback on their performance to reinforce this information. For example, in Dweck's (1975) study, children worked on arithmetic problems in which 2 or 3 failures were scheduled per session. When a failure occurred, the child was told "you should have tried harder" (Dweck, 1975, p.679). An addition to this procedure, used by Fowler and Peterson (1981) and Short and Ryan (1984), involved the recitation of self-statments linking attributions and outcomes, e.g. "Praise yourself for a job well done." (Short and Ryan, 1984, p.228)

An operant approach was taken by Andrews and Debus (1978) who reinforced all effort attributions with verbal praise or with verbal praise plus tokens.

Finally, an informational approach was employed by Wilson and Linville (1982, 1985). Their college freshmen subjects observed a videotaped interview with a senior student who claimed that many freshmen initially experience academic problems, but overcome them in subsequent years. This information was supported by statistics, and was designed to provide data on consensus and distinctiveness, leading subjects to explain their poor performances in terms of unstable factors.

In general, the interventions were conducted over relatively short periods of time. Nine of the eighteen studies reviewed used single sessions (Anderson, 1983; Andrews and Debus, 1978; Cullen and Boersma, 1982, Gattling-Stilller et al, 1981; Medway and Venino, 1982; Wilson and Linville, 1982, 1985; Zimmerman and Ringle, 1981). With one exception, the remaining studies used between three and five sessions. Although the actual duration of these sessions is not available in all cases, between 40 and 60 minutes appears to be the usual time span. In the initial attributional retraining study conducted by Dweck (1975), sessions were conducted over 25 days. It is possible that Dweck chose to work over this long period of time because

the effectiveness of the intervention had not yet been established, and because subjects were identified as having extreme reactions to failure.

#### Dependent Variables and Results

It is clear from Table 6.1 that, in general, attributional retraining is successful in influencing a variety of dependent variables in the predicted directions. The dependent variables fall into two categories: measures of cognitive change (e.g. generalised beliefs, specific attributions, success expectancies, and perceptions of self-efficacy) and measures of behavioural change (e.g. persistence, performance, and resistance to extinction). Only two studies (Schunk, 1981; Short and Ryan, 1984) failed to register any significant effect. In Schunk's (1981) study, children with low arithmetic achievement either received didactic instruction in division operations or observed a model verbalizing aloud and solving division problems. In each of these conditions children were allowed the opportunity to practice division skills and were given feedback linking their successes and failures to effort. While both conditions enhanced division persistence, accuracy and perceived efficacy, the attributional feedback had no significant effect on the perceived efficacy of arithmetic performance. Schunk postulated that the feedback may have lost credibility or produced only transient effects because of the high difficulty level of

the problems. It is logical to believe that when tasks are perceived as extremely difficult, effort alone will not ensure success. (Thus, it can be argued, tasks of intermediate difficulty are most suitable for use in conjunction with effort attributional feedback.)

A second explanation given for the failure of effort attributions to produce significant effects is the reluctance of children to make vulnerable their sense of self-worth by trying hard and risking failure (see Chapter 4).

Short and Ryan (1984) found that attributional retraining only minimally assisted strategy training in improving the performance of subjects deficient in reading skills. Attributional feedback alone, unaccompanied by strategy training, had no effect on performance. The authors concluded that feedback relating academic successes and failure to effort is inappropriate in the absence of requisite skills.

*Cognitive Change:* With regard to cognitive variables, attributional retraining is generally successful in producing change in specific attributions (Andrews and Debus, 1978; Dweck, 1975; Fowler and Peterson, 1981; Gattling-Stiller et al, 1979; Schunk, 1984). These are usually measured by asking subjects to choose from a number

of alternatives the cause of a particular outcome on a specific behavioural task presented to them by the experimenter; or to nominate the extent to which these alternatives accounted for their performance. For instance; Schunk (1984) asked children to rate the extent to which ability, effort, task difficulty and luck contributed to their performance ranging from 0 (not at all) to 100 (a whole lot).

However, generalised belief systems, usually measured by the Intellectual Achievement Responsibility Scale (IARS), tended to remain unchanged (Andrews and Debus, 1978; Dweck, 1975; Medway and Venino, 1982). This is not surprising since the IARS requires the subject to explain a variety of situations, which may be only loosely related to those used in training and pre- and post-testing.

Attributional retraining has also been effective in increasing success expectancies (Anderson, 1983; Wilson and Linville, 1982) and perceptions of self-efficacy (Schunk, 1983, 1984; Zimmerman and Ringle, 1981).

*Behavioural Change:* Performance levels were favourably influenced in nine of the eleven studies which assessed this variable. For instance, Anderson (1983) found that subjects who were led to believe that their success in persuading students to become blood donors was due to unstable factors

actually were more persuasive than those who were told that stable factors determined their performance. Cullen and Boersma (1982) found that a combination of tutor assistance and attributional feedback resulted in an increase in the number of tangram puzzles correctly solved by learning disabled and normal children. Similarly, Dweck's (1975) subjects showed an increase in the number of arithmetic problems correctly solved after failure, compared to controls. Attributional feedback led to more rapid mastery of subtraction operations and greater skill development in Schunk's studies (1982, 1983, 1984); while Wilson and Linville (1982, 1985) found that college students who were encouraged to make unstable attributions for poor performances did better on Graduate Record Exam items immediately and one week after the intervention, and improved their Grade Point Average in the year following the intervention. Finally, Zoeller et al (1983) reported that after training their subjects reduced the time taken to complete a bolt-board assembly task.

Attributional retraining was also successful in favourably influencing persistence in nine of the twelve studies which assessed it. Andrews and Debus (1978) found that their subjects demonstrated improved persistence on a block design task and two transfer tasks (circle design and anagrams); Chapin and Dyck (1976) and Fowler and Peterson (1981) reported an increase in the number of sentences



voluntarily read aloud; Cullen and Boersma (1982) found that the number of tangram puzzles on which their subjects gave up was reduced; Dweck (1975) reported an increase in the rate of problem solving after failure; and Gerling et al (1981) noted that there was an increase in the number of attempts to solve a maze puzzle. In the Medway and Venino (1982) study, trained subjects spent more time on and solved more visual discrimination problems than subjects not given attributional feedback; similarly Zimmerman and Ringle (1981) found that the modelling of highly persistent behaviour resulted in an increase in the number of attempts to solve a wire puzzle. Finally, Wilson and Linville (1982, 1985) reported that there was a reduction in the percentage of student dropouts amongst trained subjects compared to controls.

To date, research into such issues as the generalisation and durability of training gains is scant. One exception is the study by Andrews and Debus (1978). They found that Grade 6 boys improved in persistence when their spontaneously-made effort attributions were reinforced, and that this improvement was still evident 7 to 9 days, and 4 months after the intervention. Treatment gains were also found to have generalised from the original training task (block design) to a similar task (circle design) and to a dissimilar task (anagrams). The generalisation was apparent even when an independent tester

was used and was still evident at the 4 month follow-up, though appeared to have weakened during the post-training period. Zimmerman and Ringle (1981) reported that vicariously induced motivation to achieve on a wire puzzle task transferred to an embedded word puzzle task after a delay of one day. No further follow-up was conducted in this study. Encouraging durability effects were reported by Wilson and Linville (1982, 1985). College students who viewed a single videotaped interview showed behavioural changes up to one year after the intervention. There was a decrease in the student dropout rate and an increase in Grade Point Averages during the year following the intervention. The use of a "real-life" variable (Grade Point Average), rather than experimental tasks, adds particular relevance to this research.

In general, the available literature indicates attributional retraining to be an effective intervention. However, large differences in subject selection and retraining procedures make comparisons of efficacy and the identification of crucial treatment components a difficult task.

## Factors Influencing the Effectiveness of Attributional Retraining.

### Pattern of Successes and Failures

A number of factors appear to influence the effectiveness or otherwise of attributional retraining programs. Amongst these is the pattern of successes and failures used in training tasks. The partial reinforcement extinction effect (Robbins, 1971) shows that partially reinforced subjects sustain responding in the face of extinction. Awareness of this effect has led to the development of persistence training, i.e. experimenter-manipulated programs of success and failure experiences to assist in coping with unscheduled setbacks. Nation, Cooney and Gartrell (1979) and Nation and Cooney (1980), investigated the properties of persistence training in improving reactions to failure and found it to be effective in immunizing subjects against recurring failure. In the former study, even when exposed to protracted periods of failure, subjects showed enhanced persistence which generalised from a button press to a shuttle response task. A similar result was reported by Nation and Cooney (1980). The authors posited that the effect works by forcing unstable attributions, i.e. it fosters in the subject the expectancy that success will occur eventually if he continues to practise relevant behaviours.

Such research has led to investigations of the influence of varying patterns of successes and failures on the effectiveness of attributional retraining. Chapin and Dyck (1976) considered that the initial training program conducted by Dweck (1975) simulated persistence training via partial reinforcement in that it contained an irregular presentation of success and failure problems. They subsequently designed an experiment to separate out the relative contributions of reinforcement schedule and attributional retraining by crossing the number (1,3) of successive failures during training with the presence/absence of effort attributional feedback. They found that when the schedule contained multiple consecutive failures (3), feedback did not contribute to enhanced persistence. However, when the schedule consisted of consecutive successes with only single failures randomly interspersed, increased persistence resulted only when combined with attributional feedback. In contrast, Stein (1980) found that inoculation against failures occurred only with a combination of attributional feedback and a partial reinforcement schedule containing multiple consecutive failures. The same schedule alone, or a combination of feedback and a schedule containing single failures did not result in inoculations. In partial agreement with Chapin and Dyck's (1976) findings, Fowler and Peterson (1981) reported that feedback was more effective than a single failure partial reinforcement schedule in

increasing reading persistence, but that a consecutive failure schedule improved persistence even in the absence of feedback. Thus the relative contributions of partial reinforcement schedule and feedback to persistence as yet are unclear, as is the optimum schedule of reinforcement. In investigating the latter, Prindaville and Stein (1978) noted that either a variable or fixed ratio of intermittent reinforcement could prevent learned helplessness, and Medway and Venino (1982) reported that the success of attributional retraining was unaffected by an ascending versus random pattern of successes.

#### Past versus Future Feedback

A second factor which may influence the effectiveness of attributional retraining is the orientation in time of feedback. Schunk (1982) investigated the relative effectiveness of past versus future effort attributional feedback. He predicted that feedback focussing on the past (e.g. "You succeeded because you tried hard") would have more beneficial effects on performance than feedback focussing on the future (e.g. "You need to work hard"), because the former may support personal perceptions of progress, provide authentic information for judging personal capabilities, and implies social approval, whereas the latter may be interpreted as criticism for poor performance and may imply a lack of ability. Bearing out this prediction, Schunk's (1982) study showed that feedback

oriented to past performance resulted in a more rapid mastery of subtraction operations and greater skill development, while feedback oriented towards future performance had no significant effect. However, on consideration of Schunk's methodology, it appears that he may have confounded past versus future feedback with success versus failure feedback. In his study, statements directed to the past in fact constituted a comment upon a successful performance while statements directed to the future implied that performance was unsatisfactory. If past feedback had been applied to a failure outcome (e.g. "You didn't try hard enough") then it too may be interpreted as disapproval and implying lack of ability.

#### Effort versus Ability Feedback

Schunk (1983, 1984) has also examined the relative effectiveness of effort versus ability attributional feedback. Using Bandura's self-efficacy theory (1977, 1982) as his basis, Schunk predicted that feedback relating past successes to high ability would mediate higher expectancies and better performances than feedback relating past successes to high effort. This draws again on the principle of inverse compensation, i.e. believing that high effort is required for success implies a low level of ability and may weaken perceptions of self-efficacy. Schunk (1983) compared treatments consisting of ability, effort + ability, and effort attributional feedback, and found that

although all conditions led to equally rapid problem-solving, as predicted, the ability feedback condition was superior in increasing perceptions of self-efficacy and the number of post-test problems correctly solved. This finding was replicated by Schunk (1984) in which he also investigated the significance of the sequence of feedback. He contrasted four conditions, each of two parts: ability + ability, ability + effort, effort + ability, and effort + effort. The conditions in which ability feedback was given initially (ability + ability, ability + effort) proved to be most effective in improving performance on subtraction tasks and increasing self-efficacy. Schunk proposed that the children receiving only effort feedback may have questioned their level of competence (if they had to work hard to succeed), and their ability to sustain the high level of effort required for success; and that children receiving effort + ability feedback may have mistrusted statements about their high level of ability after initially being told that success was due to effort.

#### Sex of Trainer

Interest also lies in the differential effectiveness of male versus female trainers. The possibility of a sex difference in training effectiveness arises from the research of Dweck and Bush (1976) who observed the responses of Grade 5 children to failure feedback given by adults and peers of both sexes. It was found that feedback from a

female adult resulted in more helplessness than similar feedback from a male adult, and furthermore, that boys and girls had different responses to failure feedback given by a female adult. While girls tended to blame their own lack of ability for their poor performance (thus making them more susceptible to helplessness), boys tended to blame the agent giving the feedback. This allowed them the potential for a better performance when a new agent was introduced. Consequently, the sex of the trainer may be an important variable in the success of any attributional retraining technique which involves the provision of feedback about performance. It is clearly an important issue when considering the usefulness of such techniques in the primary classroom, where the majority of teachers are female.

### Modelling

Modelling or observational learning techniques clearly lend themselves to attributional retraining, particularly when considered from the standpoint of self-efficacy theory. Research shows that nearly all learning resulting from direct experience can occur on a vicarious basis (Bandura, 1969), and that modelling is especially effective in establishing abstract or rule-governed behaviour such as conceptual schemes, information-processing strategies and cognitive operations (Bandura, 1977). It appears that observers are able to derive the principles underlying a specific performance and generate behaviour that goes beyond



what they have seen or heard. Furthermore, modelling is more effective when the observer is incompetent and has low self-esteem (Bandura, 1971). To some extent, these terms are descriptive of the child whose performance is impaired by failure and who may not be incompetent generally, but does not possess strategies to cope with increases in task difficulty.

There is evidence that modelling can influence those variables relevant to reactions to failure. Performance decrements after failure have been induced in subjects who observed but did not themselves experience noncontingency (Breen, Vulcano and Dyck 1979; Brown and Inouye, 1978; De Vellis, De Vellis and McCauley, 1978). Zimmerman and Blotner (1979) found that the persistence of Grade 1 and 2 children increased after observation of a model attempting to solve a wire puzzle task. Their persistence varied directly with the duration of the model's efforts.

In addition, studies using observational learning as part of an attributional retraining program have been successful in producing attributional and behaviour change. Zimmerman and Ringle (1981) using a combination of modelled persistence and statements of confidence relating successful outcome to the application of effort, reported improved persistence in observers. It is interesting to note that the influence of statements of confidence on persistence was

seven times that of the model's duration of performance. Attributions were not measured in this study and because of the young age of the subjects (Grade 1 and 2) it is unlikely that they exerted a consistent mediating effect on performance.

Studies by Gattling-Stiller et al (1979) and Gerling et al (1981) also attempted attributional retraining via observational learning. Subjects observed, on film, a model attributing failure to lack of effort, and persisting after failure in the completion of a maze task. In the former study no significant results were obtained. However, in the latter, trained subjects showed enhanced persistence, which was further increased when the model expressed high success expectancy or, to a lesser extent, positive affect. In Zoeller et al's (1983) study, subjects observed, on film, a peer being given attributional feedback relating successes to ability and effort, and failures to lack of effort. This procedure proved to be slightly more effective than in vivo feedback given individually in improving performance after failure.

The partial reinforcement effect has also been found to occur vicariously (Berger, 1971), and investigations have been made of the relative effects on persistence of the observation of high versus low rates of reinforcement, or success. Lewis and Duncan (1958) conducted the initial

study which showed that observing a model who was successful 25% of the time resulted in greater persistence on the part of the observer than observing a model who was successful all of the time. Berger (1971) reported that observation of a 25% successful model resulted in greater persistence than observation of a 75% successful model, but only when the model and observer were peers. This finding was explained in terms of social comparison processes (Festinger, 1954). In the absence of personal task experience, observers tend to use the model's performance as a standard for comparison. Viewing a highly successful model induces in observers high success expectancies and a significant discrepancy between these expectancies and actual performance when they are faced with repeated failure or increases in task difficulty. The outcome is high frustration and low persistence. For a model's performance to be used as a suitable standard of comparison he must share opinions or abilities with observers.

However, Paulus and Seta (1975) found that expectancies were unrelated to levels of persistence, and therefore discounted the expectancy-frustration hypothesis in favour of Wyer and Bednar's (1967) exchange theory. According to exchange theory, individuals weigh potential gains and losses in attempting and performing various tasks. The observer of a highly successful model has little to gain by performing well and much to lose, and therefore does not

persist for long, whereas the observer of a mostly unsuccessful model has a great deal to gain by performing well and persists longer. (This approach shares many similarities with self-worth theory). Again, similarity between model and observer is required for comparison to occur.

Regardless of the mechanism underlying the effectiveness of vicarious partial reinforcement, it is clear that observational learning is an effective technique within attributional retraining programs. In addition, observational learning has many advantages. Distress arising from the possibility of failure is minimised for observers. In addition, vicarious behaviour change usually occurs within a relatively short time period (Blackham and Silberman, 1975), and can be administered to groups rather than individuals, making it a practical and feasible approach which could be integrated into the school day.

### Conclusion

A review of studies assessing the effectiveness of attributional retraining shows it to be a viable means of producing cognitive and behavioural change, particularly in improving performance after failure. This adds credence to the attributional models of achievement behaviour previously discussed. Its success with relatively short periods of

time and via observational learning make it a practical and cost-effective approach for real-life application.

However, there are some factors which need to be taken into account when designing attributional retraining programs to inoculate students against the effects of failure:

- (i) the subject's possession of the skills necessary to achieve success
- (ii) the difficulty level of training tasks. If this is too high or too low, effort feedback loses credibility.
- (iii) the age of subjects. Subjects younger than about 9 or 10 are unable to use attributions consistently. However, children over about 12 eventually learn that effort is an insufficient prerequisite for success (see Chapter 5)
- (iv) the basis of impaired performance after failure. If it is the desire to protect self-worth, then attributional retraining may not be an appropriate intervention (see Chapter 4).

In the next three chapters, a series of experiments is reported which examines the efficacy of two attributional retraining procedures for primary school children whose performances are impaired after failure.

## CHAPTER 7

### EXPERIMENT 1

IMPROVING PERSISTENCE THROUGH  
ATTRIBUTIONAL RETRAINING WITH AN  
OBSERVATIONAL LEARNING COMPONENT

## CHAPTER 7

### EXPERIMENT 1

#### IMPROVING PERSISTENCE THROUGH ATTRIBUTIONAL RETRAINING WITH AN OBSERVATIONAL LEARNING COMPONENT.<sup>1</sup>

As reviewed in Chapter 6, attributional retraining is generally successful in producing behavioural and cognitive change: in increasing persistence and performance, modifying maladaptive attributional patterns, and increasing success expectancies and perceptions of self-efficacy. Investigations of attributional retraining programs which have included an observational learning component have also produced encouraging results (Gerling et al, 1981; Zimmerman and Ringle, 1981; Zoeller et al, 1983).

However, because of methodological problems and variations in subject selection, training procedures, and dependent variables, it is not possible to conclude that attributional retraining via observational learning is an effective intervention for all or other populations. For instance, Zimmerman and Ringle (1981) worked with Grade 1 and 2 lower-class black and Hispanic children; Zoeller

<sup>1</sup> A copy of the published version of this study is included in Appendix 1.

et al (1983) with mentally retarded adults; and Gerling et al (1981) with Grade 5 and 6 children. Although Gerling et al's subjects were of optimum age for the effort attribution training they received (see Chapter 5), their selection for training was on the basis of low achievement motivation. This variable was not assessed after training and its use as a criterion for selection can be questioned. In a study which uses persistence as the dependent variable, a better criterion for selection would have been low persistence prior to training.

Because of the potential practical utility of attributional retraining via observational learning, it is desirable to continue to test its efficacy. In the study reported in this chapter, it was predicted that Grade 5 and 6 children who showed low persistence on a puzzle completion task after the experience of failure, would show an improvement in persistence following observation of a model who was encouraged to relate successes and failures to effort. Grade 5 and 6 children were chosen as suitable subjects in view of evidence that consistency in the use of causal attributions does not develop until the age of 9 or 10 (e.g. Nicholls, 1978; see Chapter 5).

Ancillary to the central treatment aim of the study, two secondary predictions were made. The first of these relates to sex differences. In line with the large amount of research



indicating that females are more likely than males to make stable attributions for failure (Bar-Tal, 1978; Covington and Omelich, 1979a; Dweck and Bush, 1976; Dweck and Reppucci, 1973; Dweck et al, 1978; Nicholls, 1975, 1979;) and that females are more vulnerable to learned helplessness (Dweck and Gilliard, 1975; Dweck and Reppucci, 1973; Gody, 1978; Le Unes, Nation and Turley, 1980; Maccoby, 1966; Nicholls, 1975; Veroff, 1969; Welch and Huston, 1982; Wilson, Seybert and Craft, 1980) it was expected that females would place less emphasis on the role of effort in explaining their failure and demonstrate lower persistence levels than males.

It was also predicted that there would be a positive relationship between persistence and intellectual ability. Children whose intelligence lies in the retarded range are more likely to react to failure with reduced persistence compared to normals (See Chapter 5). This is assumed to occur in part because retarded children have a history of experiences in which their responses have largely failed to control outcomes, leading them to the conclusion that they are incapable of obtaining desired outcomes. It seems likely that this paradigm will also apply, to a lesser degree, to children whose intelligence lies at the lower end of the normal range.

## Method

### Subjects

Thirty-seven male and 28 female pupils from two state primary schools near Hobart constituted the initial sample for the study. Mean ages were 10 years 11 months for the girls and 11 years 4 months for the boys. At school A, the subjects were Grade 5 and Grade 6 pupils from a composite Grade 5/6 classroom with a male teacher. At school B, the subjects were drawn from Grade 4/5 and Grade 5/6 composite units each of which shared a male and a female teacher. Only Grade 5 pupils from school B participated in the study. The catchment areas of both schools are mixed in terms of socio-economic class but include a large percentage of working-class families.

### Pre-training Assessment

Pre-training assessment consisted of measures of intellectual ability, effort attributions for failure and persistence. The persistence score was obtained by individual assessment; the remaining scores were derived from group administration of questionnaires completed in two sessions on consecutive days.

*Intellectual ability* This was assessed using Raven's Progressive Matrices (PMS; Australian Council for Educational Research, 1958), a test of non-verbal intelligence. It is a timed test consisting of 60 incomplete designs, which the subject is required to complete by selecting missing sections

from multiple choice arrays. Raw scores are converted to intelligence quotients. The Council for Educational Research (1958) has prepared Australian norms covering the range 10 to 18+ years, and reports high reliability scores and adequate validity.

*Effort attributions* A subscale of the Intellectual Achievement Responsibility Scale (IARS; Crandall et al., 1965) was used to obtain an index of the extent to which lack of effort is construed as a cause of failure. (Appendix 2.1) The IARS is a locus of control questionnaire designed to determine the degree to which a child believes that the intellectual failures and successes he encounters are a result of his own behaviour versus the behaviour of important others in his environment (such as teachers, parents and friends). It is comprised of 34 forced-choice items each depicting a positive or negative achievement situation and presenting two attributions to choose from: internal, in which responsibility for the outcome is assumed by the subject; or external, in which responsibility for the outcome is relegated to some property of the situation or other person. Crandall (1978) obtained a test-retest reliability of 0.76 for the IARS. Research with the scale indicates that learned helpless children take less personal responsibility for the outcomes of their behaviour and place less emphasis on the role of effort in determining success and failure than more persistent children (Crandall 1978; Dweck, 1975; Dweck and Reppucci,

1973). A subscale of 10 items presents negative achievement situations and requires the subject to choose between his own lack of effort and an external factor as the causal attribution. Diener and Dweck (1978, 1980) found the subscale to distinguish between learned helpless and mastery-oriented subjects. In scoring the subscale one point is awarded for each effort attribution with a low score being associated with helplessness.

*Persistence* An index of persistence was obtained by assessing each subject's performance on a test of 15 unsolvable problems devised by the author. (Appendix 3.1) The top row of each problem contained a series of four patterns followed by a blank shape. The subject was required to fill in the blank shape and complete the sequence, by selecting from an array of four patterns given. The patterns were adapted from the Advanced Progressive Matrices, Set II (Raven, 1962). The instructions to each child were as follows:

"We are going to do some puzzles. You will see on the first page of this book five shapes, the last one is blank. You have to find which one of the numbered shapes below fits into the blank space in the top row to follow on the pattern. If you look at the first one you can see that number 1 will fit into the top row to continue the pattern. When you decide which of the numbered shapes is the right one, write your answer on the sheet. Each time you write an answer a light will come on to tell you if you are right or wrong; a green light for right, and a red light for wrong. Don't change your answer if it is wrong, just go on to the next one. I would like you to do at least five puzzles; after that you can stop whenever you like. Close the

book when you have finished all the puzzles you would like to do. You can start now."

The red light feedback was incorporated to enhance the salience of the failure result. The Persistence score was obtained by summing the number of seconds spent on items 6 to 15. It was assumed that susceptibility to helplessness would be reflected in shorter times spent on each problem and a willingness to finish the test earlier, thus resulting in a lower Persistence score.

In order to provide some check on the success of the experimental manipulation, after completing the unsolvable problems, subjects were asked, "Do you think you made mistakes because I (the experimenter) was not telling you the truth about whether your answers were right or wrong?" None of the subjects answered affirmatively.

Finally, a set of eight easily solvable general knowledge questions was administered and the subject's success with these was stressed, to ensure that he did not leave the session with a feeling of failure. (Appendix 2.2)

The author was assisted by a female undergraduate Psychology student, who administered the Persistence measure to approximately half of the subjects.

### Selection of subjects for training

Pre-training Persistence scores ranged between 0 and 291 seconds for boys, with a mean of 103.05 seconds; and between 0 and 167 seconds for girls with a mean of 78.75 seconds. Subjects who spent less than 80 seconds on the puzzles were selected as being least persistent. Thirty-two of the 65 subjects fell into this category: 18 or 49 per cent of the boys, and 14 or 50 percent of the girls. These 32 subjects were selected for participation in the second phase of the study. The sexes were randomly allocated to training and control groups, and paired according to sex, Persistence and PMS scores. (The latter were included in order to account for the possible influence of intelligence on the effectiveness of the training procedure.) Two boys were absent for the second phase, leaving training and control groups each consisting of seven girls and eight boys. The matched groups did not differ significantly on the Persistence ( $t(14) = 0.45, p > 0.05$ ) or PMS measures ( $t(14) = 0.29, p > 0.05$ ).

### Training

Training was directed at teaching the least persistent subjects to attribute outcomes to effort, through an observational learning procedure. To this end, an 8-minute training film was made in which a model was seen answering a set of 18 puzzles of the type used in the pre-training Persistence assessment. (Appendix 3.2) The model obtained success on these items at a rate of 33 per cent; the successes

were arranged in a partial reinforcement schedule with consecutive failures prior to success. There is evidence that this type of schedule (Chapin and Dyck, 1976; Nation et al, 1979; Nation and Cooney, 1980; Stein 1980) and rate of success (Prindaville and Stein, 1978) is effective in overcoming learned helplessness.

In order to facilitate imitation, the model was rewarded for a correct answer by a green light and a token which could be exchanged for a selection of prizes at the end of the session. She/he was also told, "Good, you have chosen the right answer; that means you tried hard." Following a wrong answer, a red light was displayed and the model was told "That's the wrong answer; that means you should have tried harder."

Female experimental subjects observed a female model, while the male experimental subjects observed a male model. Both models were attractive 11-year-old children unknown to the subjects. Prior to viewing the films, the subjects were told:

"We are going to watch a film that will help you to do your work at school. You will see a girl(boy) who is very much like you - she(he) doesn't go to this school, but to a school near here, and she(he) is about the same age as you are. This girl(boy) is going to be doing some puzzles. Notice that when she(he) does not try very hard or spend much time on the question she (he) always gets the wrong answer. When she(he) does try hard and spends more time working out an answer she(he) always gets it right. Each time the answer is right she(he) earns a token to swap for a prize afterwards."

The subjects viewed the film for a second time, two days after the first showing. The control group saw two 8-minute excerpts from the television show "The Muppets" in place of the training film.

#### Post-Training Assessment

Post-training assessment was undertaken on the day following the final film viewing. A second Persistence measure was obtained through repetition of the pre-training procedure using alternative, but similar puzzles. (Appendix 3.3) Again, the score was derived by summing the number of seconds the subject was willing to spend on items 6 to 15 in the face of consecutive failures, and again, none of the subjects indicated that they felt the experimenter was unreliable when giving failure feedback.

#### Results

The predictions under investigation in the first phase of the study, prior to the selection of subjects for intervention, concerned the relationships between persistence behaviour, attributional patterns and general intelligence. The existence of sex differences in persistence and attributional patterns was also the subject of examination. Table 7.1 presents the mean scores obtained for the variables assessed in the first phase.



Table 7.1  
Means and standard deviations of scores on  
pre-training measures

	Boys (N = 37)		Girls (N = 28)	
	M	SD	M	SD
PMS <sup>a</sup>	104.16	14.46	105.50	14.10
IARS <sup>b</sup>	6.87	1.83	5.32	2.02
Persistence <sup>c</sup>	103.05	66.88	78.75	46.00

<sup>a</sup> Scores represent intelligence quotients.

<sup>b</sup> Maximum score = 10, high scores reflect attributions to lack of effort for failure.

<sup>c</sup> Scores in seconds.

The correlation between Persistence and IARS scores was found to be highly significant for both male ( $r(35) = 0.69$ ,  $p < 0.005$ ) and female subjects ( $r(26) = 0.76$ ,  $p < 0.005$ ). This supports the well-established association between willingness to persist in the face of consecutive failures, and an attributional disposition to construe failures as the result of lack of effort.

Intelligence levels, as assessed by the PMS, ranged between quotients of 82 and 134. About 87 per cent of the general population fall into this range (Australian Council for Educational Research, 1958). Those with high scores would be considered to have superior intelligence, and those with lower scores described as borderline (between dull-normal and mental retardation). The relationship between Persistence and PMS measure was found to be non-significant for male ( $r(35) = 0.19$ ,  $p > 0.05$ ) and female subjects ( $r(26) = 0.22$ ,  $p > 0.05$ ). Neither were significant associations found between IARS and PMS scores (Male:  $r(35) = 0.02$ ,  $p > 0.05$ ; Female:  $r(26) = 0.12$ ,  $p > 0.05$ ). It appears that intelligence, when lying essentially within the normal range, does not have a consistent influence on behavioural persistence or attributional patterns.

The Persistence and IARS scores of the 37 male and 28 female subjects were compared. There was a trend for the girls to have lower Persistence scores than boys ( $t(63) =$

1.63,  $0.10 > p > 0.05$ ). A significant sex difference was noted in IARS scores ( $t(63) = 3.17$ ,  $p < 0.005$ ), with girls more likely to neglect the role of effort in causing their failures. Thus, while female subjects showed the attributional pattern associated with learned helplessness their behaviour was only marginally less persistent than that of male subjects.

In the second phase of the study, the central hypothesis concerned the effectiveness of vicariously presented attributional retraining in improving persistence. Table 7.2 shows the mean persistence scores of the 32 least persistent subjects both prior to and following the intervention.

The pre-training Persistence scores of these subjects and those of the more persistent subjects who did not take part in the second phase differed significantly. (Males:  $t(35) = 7.64$ ,  $p < 0.0005$ ; Females:  $t(26) = 7.68$ ,  $p < 0.005$ ).

Treatment effects were evaluated at post-training using a covariance analysis with pretraining Persistence as the covariate. (Appendix 7.1) The analysis showed a significant main effect for Experimental Condition ( $F(1,25) = 11.63$ ,  $p < 0.01$ ) and also a significant sex by Experimental Condition interaction ( $F(1,25) = 7.96$ ,  $p < 0.01$ ). No significant main effect was found for sex ( $F(1,25) = 1.64$ ,  $p > 0.05$ ). Post-hoc analyses using t-tests to compare adjusted group means showed

Table 7.2

Means and standard deviations of persistence scores  
obtained at pre- and post-training assessment, for  
training and control groups (in seconds)

		Training		Control	
		Pre	Post	Pre	Post
Boys	M	48.50	63.50	44.25	48.88
	SD	27.20	66.14	27.60	65.17
Girls	M	40.86	132.71	40.00	16.86
	SD	28.28	36.44	24.05	16.22

that the difference between treatment conditions was significant for female subjects ( $t(12) = 4.56, p < 0.001$ ) but not for male subjects ( $t(14) = 0.43, p = 0.60$ ). The vicarious attributional retraining was therefore effective in improving Persistence in females only.

### Discussion

The major tenet of the cognitive model of achievement motivation is that causal ascriptions influence and perhaps even determine subsequent achievement behaviours. The correlation between level of persistence and responses to the IAR subscale tends to support this. A high degree of persistence was associated with attributions for failure to lack of effort. In addition to the confirmation of past research (eg. Dweck and Reppucci, 1973; Andrews and Debus, 1978; Diener and Dweck, 1978), this finding adds strength to the rationale of improving persistence through a reattribution approach.

In view of the prevalence of learned helplessness in retarded children (Weisz, 1979), the failure to find any relationship between intelligence and attributions, or intelligence and persistence was surprising. Perhaps, the performance history of the low-normal IQ subjects in this study was not dominated by failure to the extent that they learned to view themselves as incapable of achieving success.

An issue yet to be investigated is the association between superior intelligence, attributions and persistence. It may be that particularly bright children are as vulnerable to learned helplessness as retarded children since their performance histories would involve little contact with failure, and therefore few opportunities to develop strategies to cope with failure. Experimentally, a success only reinforcement schedule has been shown to be ineffective or less effective than partial reinforcement in enhancing persistence (Nation et al, 1979).

A second finding at odds with previous research was the lack of significant sex differences in persistence levels. There was a marginal trend for girls to be less persistent than boys, but this did not reach significance. Despite this, sex differences in attributional styles were found, with boys placing more emphasis on lack of effort as an explanation for failure.

That observational learning is a successful means of enhancing persistence received only partial support in this study. Observation of a model who was rewarded for attributing failure to lack of effort was paralleled by a significant increase in persistence, in female subjects, but failed to produce improvements in male subjects.

The differential effectiveness of observational learning is consistent with proposals that males and females differ in the extent to which they draw on environmental factors in performance evaluation. The literature on field dependence, for instance, shows that the perceptions of males are more independent of contextual cues than the perceptions of females (Witkin and Goodenough, 1977). Similarly, Rothbaum's (1981) work on control and responsibility has shown that males are more concerned with what they are able to do irrespective of others, whereas females are more concerned with what other persons can do. To account for these sex differences, it has been proposed (Crandall, 1963; Crandall, Dewey, Katkovsky and Preston, 1964; Veroff, 1969;) that during childhood boys develop internal standards of evaluation which allow them to become relatively independent of feedback from others, while girls remain dependent on external evaluation to assess the quality of their performance.

Assuming that boys and girls do differ in this way, then it is possible to explain the sex difference in treatment effectiveness using an extension of the exchange theory analysis of achievement behaviour (Wyer and Bednar, 1967). According to this analysis the observer of a model receiving rewards for his behaviour compares himself with the model, and acquires expectations for his own reward or success based on the degree of the model's success. When the observer subsequently participates without success, his degree of

tolerance for failure (i.e., his willingness to persist) is related to the expectations he has developed. A low success expectancy will be acquired if the observer views a model with a low success rate, such as the 33 per cent rate of correct answers employed in this study. This low success expectancy will result in a high frustration tolerance and high level of persistence when the observer is faced with consecutive failures himself. Given that female observers have a greater need than male observers for external evaluation, their expectancies and subsequent behaviours will be modified to a larger extent by the social comparison process. Thus, girls may demonstrate higher levels of persistence than boys after observing a model with a low rate of success.

An alternative and perhaps more straightforward explanation of the sex difference found can be derived from self-worth theory (See Chapter 4). Self-worth theory asserts that achievement behaviour is largely determined by student attempts to maintain a self-concept of high ability. From this perspective, a combination of high effort expenditure and failure is potentially threatening to the student since it increases suspicions of low ability. Just such a combination was presented to subjects in post-training assessment; they were asked to tackle unsolvable problems after being trained to associate effort with achievement and lack of effort with failure. Research into self-worth motivation suggests that males are more accomplished at self-aggrandisement and more



concerned with maintaining an appearance of competence than females (Covington and Omelich, 1979a; Covington et al., 1980). This greater desire for the protection of self-worth may explain why the boys were less willing to expend effort at post-test than the girls, thus achieving lower persistence scores. This possibility is considered further in Chapter 8.

## CHAPTER 8

### EXPERIMENT 2

LEARNED HELPLESSNESS, SELF-WORTH PROTECTION  
AND ATTRIBUTIONAL RETRAINING.

## CHAPTER 8

### EXPERIMENT 2

#### LEARNED HELPLESSNESS, SELF-WORTH PROTECTION AND ATTRIBUTIONAL RETRAINING<sup>2</sup>

In Experiment 1 it was found that a vicarious attributional retraining technique was associated with increased persistence in female subjects, but it had no effect on the persistence of male subjects. It was suggested that one possible explanation for this sex difference in treatment efficacy lies in self-worth theory: perhaps some subjects, particularly males who are more concerned with maintaining an appearance of competence than females, deliberately reduced their level of effort after failure in an attempt to protect a sense of self-worth. If this was their motivation, then it is not surprising that an intervention encouraging them to apply more effort on a task which, according to past performances carries a high probability of failure, was ineffective. Such an intervention is essentially directed towards learned helpless children whose deteriorated performance after failure is assumed to be mediated by a belief that they are

<sup>2</sup> A copy of the published version of this study

is included in Appendix 1.

incapable of achieving success, i.e., that relevant outcomes are not contingent on their responses.

It seems logical to propose that both self-worth protection and learned helplessness exist amongst primary school children. Some children may show decreased persistence after failure because they wish to avoid the appearance of inability, and others because they believe they are unable to control outcomes and trying is therefore irrelevant. Distinguishing between these two populations is important, since attempts to overcome low persistence will have varying effects depending on the reason for its existence. While it may be useful to train helpless students to attribute failure to low effort, to do so with self-worth motivated students may decrease persistence further. (If failure still occurs, even with the application of more effort, inability is strongly implicated).

The main purpose of this study is to distinguish between those children whose deteriorated performance after failure is a consequence of learned helplessness, and those whose performance is motivated by self-worth considerations. It is predicted that these two groups will differ in their attributions for failure, and in their response to an attributional retraining procedure (i.e. learned helplessness children will place more emphasis on lack of ability as a cause of failure and will show improved performance after

training). It is further predicted that females will predominate in the learned helpless group and males in the self-worth group.

In addition, the relationship of self-esteem to learned helplessness and self-worth motivation will be investigated. Research reviewed in Chapter 5 suggests that low self-esteem children are more vulnerable to learned helplessness. Whether high or low self-esteem children are more likely to engage in self-worth protection strategies has not previously been examined.

## Method

### Subjects

Thirty-five male and thirty-four female pupils from a State primary school near Hobart constituted the initial sample for the study. They were drawn from Grade 4, 5 and 6 classrooms. The mean age was 10 years 7 months for both males and females. Grades 4 and 6 were taught by females, and Grade 5 by a male teacher. The catchment area of the school is mixed in terms of socio-economic status but is predominantly lower middle class.

### Pre-training Assessment

Pre-training assessment consisted of measures of self-concept, performance after failure, attributions for

failure, and response to a 'mitigating circumstance' which could account for failure without implicating low ability.

*Self-Esteem:* This was assessed using the School Form of the Coopersmith Self-Esteem Inventory, (Coopersmith, 1981). (Appendix 2.3) The Coopersmith Inventory is a 58 item questionnaire designed to measure evaluative attitudes toward the self in social, academic, family and personal areas of experience. A Lie Scale is also included. Kimball (1973) obtained reliability coefficients ranging from .87 to .92 for Grades 4 to 8; Spatz and Johnston (1973) obtained a coefficient of .81 for Grade 5. Adequate concurrent and construct validity have been reported by Kokenes (1974, 1978), and Simon and Simon (1975).

Pupils completed the inventory in classroom groups. None recorded extreme Lie scores.

*Performance after Failure and Response to a 'Mitigating Circumstance':* These were assessed using 4 sets of sums : Sets A - D. (Appendices 4.1 - 4.4) The sets consisted of 10 sums for Grade 4 pupils, 15 sums for Grade 5 pupils, and 18 sums for Grade 6 pupils. Sets A, C and D were constructed so as to be within the capability of each child, according to his teacher's report, and consisted of sums requiring the operation of the four basic processes: addition, subtraction, multiplication and division. The

sums were classified according to a number of categories (with and without re-grouping, short and long division, short and long multiplication, inclusion of a zero in the figure, decimal figures). These categories were represented consistently across Sets A, C and D, although the actual numbers were altered. In this way the sets were matched for difficulty. Children were told that they were required only to do as many sums as they wished. An addition was made to the instructions for Set D: 'The sums in Set D are much harder than the others you have just done. I do not expect you to get many right. Just do as many sums as you like. You can stop when you want to.' This instruction was included to provide an explanation for failure which does not implicate low ability.

Set B was designed to provide a failure experience. It consisted of sums two-thirds of which were intended to be beyond the capability of the pupils. They were required to complete all of the sums in this set, and the salience of failure was enhanced by the Experimenter marking the sums in the child's presence. At least two thirds of the sums were marked as incorrect. Following the marking of Set B, pupils were required to indicate whether they had made some mistakes or achieved correct answers on all the sums, and to rate how well they felt they had done on Set B (very poorly, just OK, or very well). These questions were included to provide some check on the success of the experimental

manipulation, i.e., that pupils did perceive Set B to be a 'failure experience'. Answers to the questions indicated that this was the case.

Attainment on Sets A, C and D was measured by a composite score taking into account both the number of sums attempted and the number correct in each set.

The index of performance after failure was calculated by subtracting the attainment score on Set C from the attainment score on Set A.

*Attributions for Failure:* Scales to measure attributions for failure were included following Set B. (Appendix 2.4) Attributions used were the four commonly employed by students to explain their performances, and described by Weiner (1979): luck, task difficulty, effort and ability. Pupils were asked to indicate on a 7 point scale (ranging from 1 : not at all important, to 7 : very, very important) how important bad luck, the difficulty of the sums, lack of trying and lack of ability were as causes of their mistakes. The Grade 4 children were given prior instruction in and practice with the use of such scales to ensure understanding of the different numerical values.

Following the procedures used by Arkin and Maruyama (1979), and Gollwitzer et al, (1982), the four attributional



measures were combined to create two distinct dimensions: internal-external and stable-unstable. These dimensions are delineated in Weiner's taxonomy of causes (1972, 1979, 1985). An index of internality was obtained by subtracting luck plus difficulty from the sum of effort plus ability scores, and of stability by subtracting luck plus effort from the sum of ability plus difficulty scores. The possible range for these composite scores is -12 to +12, with positive scores indicating internal and stable attributions and negative scores indicating external and unstable attributions.

#### Selection of Learned Helpless and Self-Worth Groups

Pupils whose performance deteriorated after failure (i.e. whose score on Set C was lower than the score on Set A) were selected for training in the second phase of the study. Twenty-nine (42% of the initial sample) fell into this category.

Division into learned helplessness and self-worth groups was based on their responses to the 'mitigating circumstance'. Those who did better in Set D than A were classified as subjects motivated by self-worth considerations, i.e., their performance improved when the necessity for protecting self-worth was removed. Eleven pupils (five girls and six boys) fell into this category. Those who did better in Set A than D were considered to be

displaying learned helplessness: their performance had already been disrupted by failure and the description of high task difficulty produced a further deterioration. Eighteen pupils (10 girls and 8 boys) were classified in the learned helplessness group.

### Training

Training was based on the reattribution approach; it was designed to counteract the disruptive effect of failure by encouraging pupils to view failures as a result of lack of effort, and to view subsequent successes as more likely with increased effort.

Pupils worked together in groups of 5 or 6 same-sex children, whose capability at sums was roughly equivalent. Thirty sums were displayed on a blackboard. The sums were arranged such that one in three was extremely difficult (and failure was anticipated on these) and no more than two 'failure' sums occurred consecutively. The remaining sums were within the pupils' capabilities, and success was expected.

Pupils were told that they had been selected to play a Maths Game, with the following procedure. Each person in rotation had the opportunity to throw two dice. Two sixes earned a chance to work some sums on the blackboard, as many as could be completed until the next double six was thrown

by another member of the group. When this occurred, the next person came to the board and began to work a new sum. Each time a sum was completed the game playing was stopped, and the correctness or otherwise of the solution was signalled by a green light for a right answer, and a red light for a wrong answer. At this point, the pupil who had completed the sum was asked to make an attribution for the outcome by selecting from the following choices which were displayed on a large chart:

I got the sum right because:    I had good luck

It was easy

I tried hard

I am clever

I got the sum wrong because:    I had bad luck

It was too hard

I didn't try hard enough

I'm not clever enough

Spontaneously made effort attributions were verbally reinforced by the Experimenter (e.g. 'Yes, that's right. You got the sum right because you did try hard'.) Minimal cuing was allowable when spontaneous effort attributions were not forthcoming (e.g. 'I think you got the sum wrong because you weren't trying hard enough'). In practice such cues were rarely needed, other than in the first few minutes of the game which lasted between 30 and 40 minutes in all.

The fact that children were required to make attributions publicly may have influenced their attributions, though any influence is likely to have been in the desired direction (House, 1980).

The procedure aimed to maximise cost-effectiveness (by working with groups rather than individuals) and the benefits of participant modelling. Although it is possible that presenting training in the form of a dice game may have reduced its significance to some children, it was decided to do so in order to reduce the possible inhibiting effect of self-consciousness. Brockner (1979a) suggests that the performance of low self-esteem individuals can be improved by reducing anxiety before making them self-aware.

#### Post-training Assessment

The second phase of the study was designed to measure the effectiveness of training on the disruptive effect of failure, and on attributions for failure. Post-training assessment consisted of administration of Sets E, F and G. (Appendices 4.5 - 4.7) These were matched for difficulty with Sets A, B and C and followed the same procedure and instructions. As before, an index of performance after failure was obtained by subtracting the attainment score on Set G from the attainment score on Set E. Attributions for failure were assessed as before, following completion of Set

F (the failure experience). These measures were taken on the same day or the day following training.

All pupils were debriefed after post-training measures were completed, and emphasis was placed on the fact that failures in Sets B and F were contrived by the experimenter, and therefore did not reflect on pupils' ability levels. Many pupils expressed surprise that the outcome had been manipulated in this way and it can be concluded that pupils were naive to the manipulation.

### Results

The main purpose of this study was to examine the self-esteem, attribution and response to attributional retraining of those children whose performance deteriorated after failure. Analyses were also conducted on the scores of the initial sample of 69 children. Although the dependent variable measures probably do not constitute interval scales, the use of parametric statistical tests is still appropriate provided the score distributions do not markedly depart from the normal form (McNemar, 1969). Accordingly parametric procedures were used in analysing the results.

Table 8.1 shows the mean scores obtained from the initial sample at pre-testing.

Table 8.1

Means and standard deviations of scores on pre-training measures for initial sample.

	Boys (N = 35)		Girls (N = 34)	
	M	SD	M	SD
Self-Esteem	33.11	7.03	31.29	7.81
Deterioration in Performance after Failure <sup>a</sup>	0.80	3.72	0.41	3.46
Attributions for Failure <sup>b</sup>				
Luck	3.91	1.87	4.82	1.99
Difficulty	3.86	1.77	4.15	1.67
Effort	4.26	1.90	4.77	1.72
Ability	4.23	1.75	4.79	1.87
Composite Scores <sup>c</sup>				
Internality	0.71	2.07	0.59	3.06
Stability	-0.03	4.07	-0.56	3.68
Response to a Mitigating Circumstance <sup>d</sup>	0.17	4.47	0.91	4.36

<sup>a</sup> Difference between attainment score on Set A and attainment score on Set C.

<sup>b</sup> Range = 1 (not important at all) to 7 (very, very important)

<sup>c</sup> Range = -12 (external, unstable) to +12 (internal, stable)

<sup>d</sup> Difference between attainment score on Set A and attainment score on Set D.

### Initial Sample

With one exception, no significant sex differences were noted: boys and girls did not differ in terms of self-esteem ( $F(1,25) = 0.78, p > .05$ ); the disruptive effect of failure ( $F(1,25) = 0.93, p > .05$ ); attributions for failure (Difficulty:  $F(1,25) = 0.40, p > .05$ ; Ability:  $F(1,25) = 0.08, p > .05$ ; Effort:  $F(1,25) = 3.25, p > .05$ ); or response to a mitigating circumstance ( $F(1,25) = 0.55, p > .05$ ). However, girls were found to rate luck as a more important cause of failures than boys ( $F(1,25) = 6.07, p < .05$ ). (Appendix 7.2)

Relationships between self-esteem and A-C (response to failure), and self-esteem and A-D (response to a mitigating circumstance) were examined. Because Sets A, C and D varied in length for Grades 4, 5 and 6, a pooled within-groups correlation (Keppel, 1982) was obtained, rather than a direct correlation. The pooled correlation between self-esteem and A-C was significant ( $r = -.30, p < .05$ ) i.e. failure was most disruptive to the performance of low self-esteem children. Self-esteem was not related to response to a mitigating circumstance ( $r = .09, p > .05$ ).

Contrary to expectation, no significant correlations were found between self-esteem and attributions for failure.

### Learned Helpless and Self-Worth Groups

The 29 pupils whose performance deteriorated after failure were selected for training. Means and standard deviations obtained at pre-testing appear in Table 8.2.

These pupils had significantly lower self-esteem ( $t(67) = 2.96, p < .01$ ), and rated stable factors ( $t(67) = -3.35, p < .01$ ) as more important causes of their failures, and lack of effort ( $t(67) = 3.69, p < .001$ ) as less important, than the remainder of the sample. As a group they responded to being informed of increased task difficulty more poorly than other subjects (i.e. their A-D scores were larger) ( $t(67) = -3.15, p < .05$ ).

Of most interest is the differentiation between learned helpless and self-worth groups. By definition, the learned helpless group performed much more poorly than the self-worth group when told of increased difficulty ( $F(1,25) = 24.8, p < .001$ ); it also tended to rate lack of ability more highly ( $F(1,25) = 9.98, p < .01$ ). This was reflected in higher internality scores ( $F(1,25) = 5.27, p < .05$ ). Learned helpless and self-worth groups did not differ from each other in self-esteem ( $F(1,25) = .78, p > .05$ ) or in the extent to which failure disrupted performance, ( $F(1,25) = 1.11, p > .05$ ). (Appendix 7.2)



Table 8.2

Means and standard deviations of scores on pre-training measures for learned helpless and self-worth subjects

		Learned Helpless		Self- Worth	
		Boys (N=8)	Girls (N=10)	Boys (N=6)	Girls (N=5)
Self-Esteem	M	32.13	28.20	29.17	27.00
	SD	4.83	7.35	4.41	3.35
Deterioration in Performance After Failure <sup>a</sup>	M	4.63	4.00	4.00	2.20
	SD	2.29	2.72	5.65	1.47
Attributions for Failure <sup>b</sup>	Luck	M	3.00	4.70	3.67
		SH	2.18	1.36	1.49
	Difficulty	M	4.25	4.00	4.50
		SD	1.71	1.43	2.06
	Effort	M	3.25	4.50	3.67
		SD	1.71	1.61	1.60
	Ability	M	6.00	6.10	4.17
		SD	0.87	1.48	1.77
	Composite Scores <sup>c</sup>				
Internality	M	2.00	1.90	0.33	0.00
	SD	1.66	2.47	2.43	2.10
Stability	M	4.00	1.10	1.33	-2.00
	SD	4.09	3.52	4.11	2.28
Response to a Mitigating Circumstance <sup>d</sup>	M	4.75	5.40	-2.83	-1.20
	SD	4.55	3.58	2.85	0.40

<sup>a</sup> Difference between attainment score on Set A and attainment score on Set C

<sup>b</sup> Range = 1 (not important at all) to 7 (very, very important)

<sup>c</sup> Range = -12 (external, unstable) to +12 (internal, stable)

<sup>d</sup> Difference between attainment score on Set A and attainment score on Set D.

### Effect of Training

In the second phase of the study, the central hypothesis concerned the effectiveness of attributional retraining in reducing the disruptive effect of failure. It was predicted that only the learned helpless group would respond to training. Interest also lay in the effect of training on attributions for failure. Table 8.3 shows the mean scores and standard deviations obtained for post-training variables.

The effect of training on decrement in performance following failure (E-G scores) was examined using analysis of covariance, to make allowance for differences in set lengths as reflected in pre-training (A-C) scores. (Appendix 7.3) The assumption of homogeneity of regression (Keppel, 1982) was tested. No evidence of non-homogeneity was found ( $F(3,21) = .26, p > .05$ ).

The covariance analysis showed a significant main effect for group ( $F(1,24) = 6.38, p < .05$ ). After training, the effect of failure was significantly less disruptive for the learned helpless group than it was for the self-worth group (see Fig. 8.1). Thirteen of the learned helpless group ( $n=18$ ) actually improved after failure at post-testing, compared to 2 of the self-worth group ( $n=11$ ).

Table 8.3

Means and standard deviations of scores  
on post-training measures.

		Learned Helpless		Self- Worth	
		Boys (N=8)	Girls (N=10)	Boys (N=6)	Girls (N=5)
Deterioration in Performance after Failure <sup>a</sup>	M	-1.50	-1.70	2.67	3.20
	SD	1.00	3.41	7.43	3.97
Attributions for Failure <sup>b</sup>					
Luck	M	3.50	4.90	5.67	4.20
	SD	2.35	1.81	0.94	1.94
Difficulty	M	4.25	4.50	5.17	4.40
	SD	2.05	1.50	1.07	1.62
Effort	M	5.88	6.00	6.17	5.60
	SD	1.97	1.18	0.69	1.74
Ability	M	3.88	5.30	4.50	5.80
	SD	1.90	1.27	1.50	1.17
Composite Scores <sup>c</sup>					
Internality	M	2.00	2.90	-0.17	2.80
	SD	2.40	3.73	1.34	2.04
Stability	M	-1.25	-1.10	-2.17	0.40
	SD	3.03	1.22	2.12	2.33

<sup>a</sup> Difference between attainment score on Set E and  
attainment score on Set G

<sup>b</sup> Range = 1(not important at all) to 7(very, very important)

<sup>c</sup> Range = -12 (external, unstable) to +12 (internal, stable).

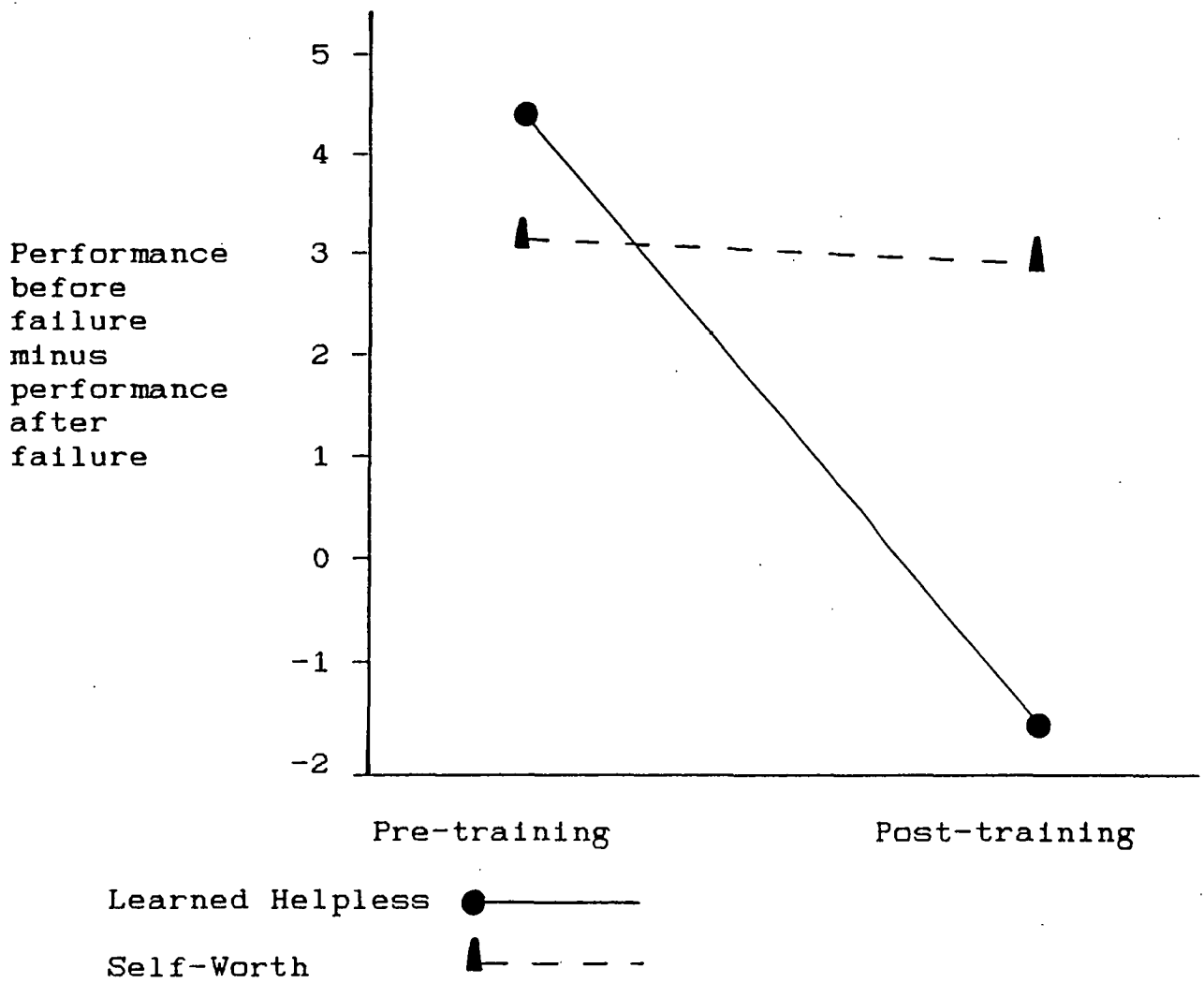


Figure 8.1 : The effect of training on deterioration in performance after failure.

Two factor analyses of variance (Groups x Occasions) were conducted to evaluate the effect of training on attributions. (Appendix 7.4) Significant main effects for Occasions were noted on the effort ( $F(1,27) = 18.05$ ,  $p < .001$ ) and stability ( $F(1,27) = 4.71$ ,  $p < .05$ ) factors. After training, lack of effort was rated more highly than before, and this change was reflected in lower stability scores.

A significant main effect for Groups was found on the internality factor ( $F(1,27) = 5.36$ ,  $p < .05$ ). The learned helpless group had consistently higher internality scores than the self-worth group at both pre- and post-testing.

Of most importance is the Groups x Occasions interaction effect, which determines whether attributional differences between learned helpless and self-worth groups altered as a result of training. This was found to be significant for the ability factor ( $F(1,27) = 9.31$ ,  $p < .01$ ). Training influenced the ability ratings of the two groups differently. At post-testing the learned helpless group placed less importance on lack of ability as a cause of failure, while the self-worth group tended to rate lack of ability slightly more highly. (See Fig. 8.2).

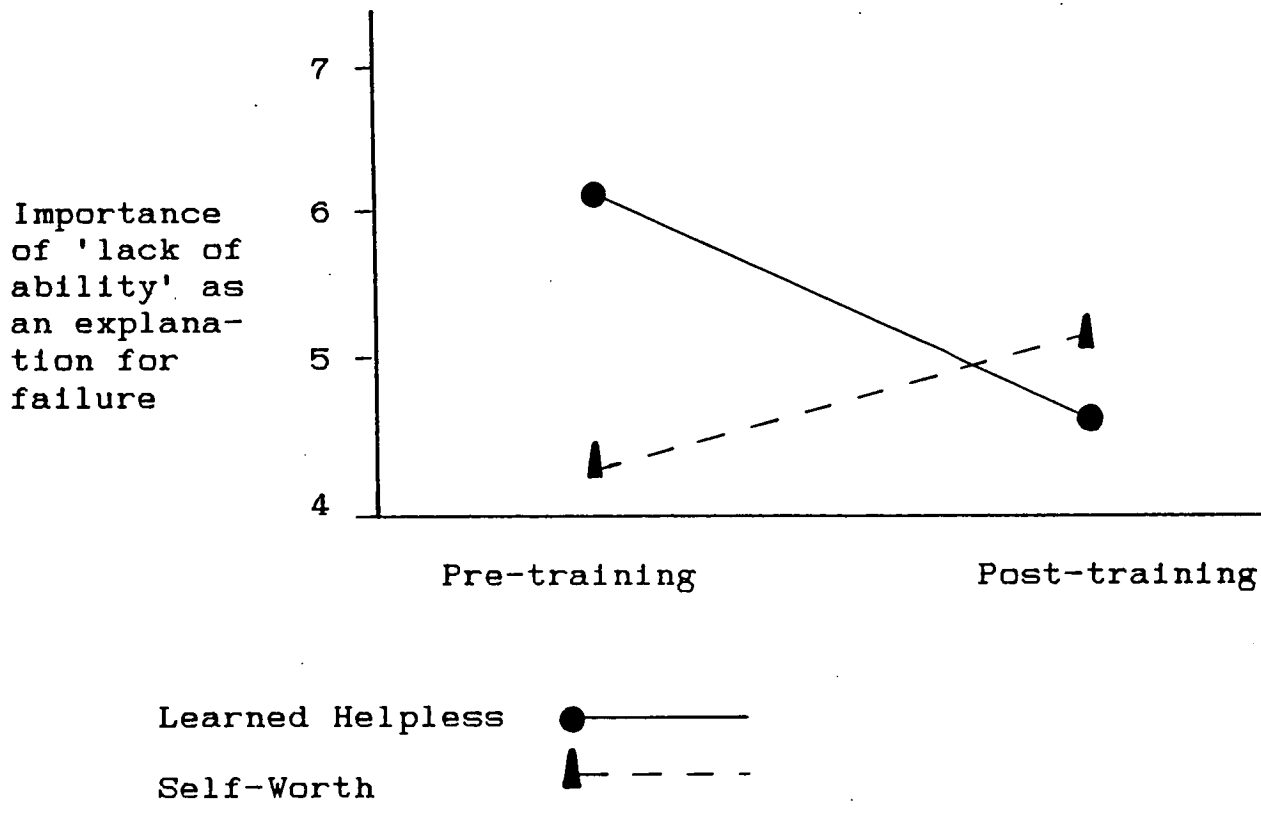


Figure 8.2 : The effect of training on ability attributions.

### Discussion

This study was designed to examine differences between those pupils whose performance deteriorated after failure because they felt academically helpless, and those who were protecting a sense of self-worth. Of most significance was the differing response of these two groups to the attributional retraining procedure. The learned helpless group appeared inoculated to the experience of failure (or even motivated by it), while the self-worth group did not respond to training. This finding is consistent with studies which have found attributional retraining to be an effective means of improving performance after failure for learned helpless subjects.

The intervention also produced attributional change. After training, both groups increased the emphasis placed on lack of effort as a cause of failure. This was expected since the intervention encouraged subjects to explain their performances in terms of the application of effort.

Attributional retraining is based on the rationale that increased emphasis on effort mediates improved performances. It is assumed that as a child comes to understand that his mistakes occur because he has not applied enough effort, and that he can improve his performance by trying harder, his perceptions of inability will decrease, and there will be a corresponding increase in feelings of self-efficacy, and

expectations for future success. Such expectations are crucial determinants of subsequent, improved performances (Bandura, 1981; Schunk, 1983, 1984).

This process appears to be operating in the learned helpless group and is reflected in their increased effort ratings, decreased ability ratings and better performances in the face of failure, after training. Although no post-training measure of self-esteem was taken, an increase in self-esteem would be predicted. Such an increase is also suggested by the correlation found in the initial sample between self-esteem and A-C scores, i.e. children with higher self-esteem found failure to be less disruptive to their performance than their peers with lower self-esteem.

Pupils in the self-worth group did not show the same responses to training. They learnt to emphasise effort, but did not make the corresponding changes in ability ratings or performance. The reason for this is not clear. However, the level of pre-training ability ratings may be important. Prior to the intervention, the self-worth group placed significantly less importance on lack of ability as a cause of failure, than the learned helpless group.

Alternatively it is possible that the improved performance exhibited by the learned helpless group was unrelated to attributional change, but occurred because the



experimenters' encouragement of attributions to lack of effort was perceived as an instruction to try harder. Hence, the learned helpless group's increased persistence following intervention could simply reflect a compliance with the instruction. If this is the case, then the self-worth group's fear of 'trying and failing' may have prevented them from complying in the same way that the helpless group did. Covington and Omelich (1979a) address this issue in describing effort as 'the double edged sword' in school achievement. When teachers give instructions to try hard and when they reward effort, they may be presenting some students with a difficult choice: between compliance (and praise), on the one hand, and self-worth protection on the other.

Although the mechanism for change remains unclear, the learned helpless and self-worth groups had markedly different responses to the intervention. Attributional retraining was effective in improving the performance of learned helpless children, but had no effect on the performance of self-worth children.

Prior to the intervention these two groups differed in their emphasis or lack of ability as a cause of failure, which (predictably) the learned helpless group rated more highly. Learned helpless and self-worth groups were not differentiated from each other in terms of sex, self-esteem,

or the extent to which performance was disrupted by failure. However, both learned helpless and self-worth groups had lower self-esteem and found failure to be more disruptive than their peers.

Together the results of Experiments 1 and 2 indicate that attributional retraining via observational learning is an effective treatment for certain upper primary school students whose performance deteriorates after failure. The generalisation and maintenance of treatment gains are assessed in a study reported in Chapter 9.

## CHAPTER 9

### EXPERIMENT 3

#### GENERALISATION AND MAINTENANCE OF TREATMENT GAINS

## CHAPTER 9

### EXPERIMENT 3

#### GENERALISATION AND MAINTENANCE OF TREATMENT GAINS

The results of Experiments 1 and 2 suggest that attributional retraining techniques with an observational learning component can be effective in inoculating some pupils against the experience of failure. Several issues need to be addressed before their application in real-life settings can be recommended. Amongst these are the generalisation and maintenance of treatment gains. Clearly, such gains will be maximised when the results of attributional retraining transfer to nontreatment settings and persist in the absence of reward.

To date, research into the generalisation and maintenance of attributional retraining effects has been extremely limited. As reported in Chapter 6, Andrews and Debus (1978) found increased persistence on a block design task and two transfer tasks (circle design and anagrams), which was still apparent 4 months after their intervention; Wilson and Linville (1982, 1985) noted an improvement in Grade Point Average and a reduction in the percentage of student dropouts in the year following training; Zimmerman

and Ringle (1981) found that the modelling of highly persistent behaviour contributed to increased persistence in attempts to solve a wire puzzle, and that this increased persistence generalised to an embedded word puzzle one day later.

Only one study has attempted to examine such issues in relation to vicarious attributional retraining. Gattling-Stiller et al (1979) asked their Grade 5 and 6 subjects to observe on film a model attributing failure to lack of effort, and persisting after failure in the completion of a maze task. The intervention had no significant effect on persistence, but was associated with an increase in effort attributions. This cognitive change did not transfer to another task.

With only one study on the transfer and durability of vicarious attributional retraining, there is insufficient evidence to indicate that this might be a useful management strategy for children with persistence difficulties. It is the aim of the study reported in this chapter to investigate the generalisation and maintenance of treatment gains achieved via the attributional retraining procedure employed in Experiment 2.

In addition, the influence of sex of trainer on treatment outcome is considered. The possibility of a sex difference in training effectiveness arises from the research

of Dweck and Bush (1976) who observed the responses of Grade 5 children to failure feedback given by adults and peers of both sexes. It was found that feedback from a female adult had a more deleterious effect on subsequent performance than similar feedback from a male adult.

In order to enhance the ease with which experimental results could be interpreted, only female pupils were used as subjects in this study.

### Method

#### Subjects

Ninety-seven female pupils from three State primary schools near Hobart constituted the initial sample for the study. They were drawn from Grade 5 and 6 classrooms. The mean age was 10 years 10 months. The catchment areas of the schools are mixed in terms of socio-economic status, but are predominantly middle class. All pupils were taught by female teachers with the exception of one Grade 5/6 composite class.

#### Pre-training Assessment

Pre-training assessment consisted of measures of performance after failure, attributions for failure, response to a 'mitigating circumstance' which could account for failure without implicating low ability, and performance

on a set of anagrams. The anagrams functioned as a transfer task, and were chosen because of their similarity to activities children are likely to encounter in the classroom.

Assessments were conducted in groups of approximately ten children by the female author.

*Performance after failure and response to a 'mitigating circumstance':* The procedure followed exactly that outlined in Experiment 2, with the exception that Sets A, B, C and D all consisted of 15 sums. (Appendices 5.1 - 5.4)

Checks on the credibility of the experimental manipulations led to the elimination of two subjects. Following the marking of Set B, pupils were required to indicate whether they had made some mistakes or achieved correct answers on all the sums, and to rate how well they felt they had done on Set B (very poorly, just OK, or very well). Answers to these questions indicated that all pupils perceived Set B to be a failure experience. Following Set D, pupils were required to indicate whether they believed the sums in Set D were harder than those in Set C. Two subjects answered negatively.

*Attributions for failure:* Scales designed to measure attributions for failure were administered following Set B. These were identical to those used in Experiment 2, (Appendix

2.4) and produced ratings from 1 to 7 of the importance of luck, task difficulty, effort and ability in causing the mistakes made in Set B (Indices of internality and stability were not calculated in this study).

*Anagrams* : A set of 20 anagrams, from Gilhoolley and Hay's (1977) list of five-letter words with single solution anagrams, was presented to subjects after the completion of Set D. (Appendix 6.1) Words which were rated as moderately to highly familiar by Gilhoolley and Hay's subjects were chosen. Subjects were instructed to complete as many word-puzzles as they wished. No time limit was imposed. Anagram performance was measured by a composite score taking into account both the number attempted and the number of correct solutions.

#### Selection of Subjects for Training

Pupils whose performances deteriorated after failure (i.e. whose score on Set C was lower than the score on Set A) and did not improve when provided with a 'mitigating circumstance' (i.e. score on Set D lower than the score on Set A) were selected for training. The performances of these subjects were considered not to be motivated by self-worth protection, but to be the result of learned helplessness and therefore most appropriate for attributional retraining.



Forty-four subjects (or 46% of the initial sample) were selected on this basis: 6 from Grade 4, 15 from Grade 5 and 23 from Grade 6.

### Training

Attributional retraining was conducted by two people : the female author and a male cohort. Subjects were randomly allocated to male trainer and female trainer groups, with 22 subjects in each.

The training followed the procedure employed in Experiment 2.

### Post-Training Assessment

The second phase of the study was designed to measure the effect of training on performance after failure and attributions for failure, the transfer of training effects from arithmetic to anagrams, and the maintenance of training effects over a period of 10 to 14 days.

*Immediate post-training assessment:* This was conducted on the same day or the day following training. It consisted of administration of Sets E, F and G which were matched for difficulty with Sets A, B and C and followed the same procedure and instructions. (Appendices 5.5 - 5.7) As before, an index of performance after failure was obtained

by subtracting the attainment score on Set G from the attainment score on Set E.

Attributional scales were completed following Set F, and a second set of 20 anagrams matched for familiarity with pre-training anagrams was administered following Set G. (Appendix 6.2)

*Delayed post-training assessment:* This was conducted 10 to 14 days after training, and followed the same format and instructions as immediate post-training assessment. Three new sets of sums matched for difficulty with those used previously (Sets H, I, J) were presented. (Appendices 5.8 - 5.10) An index of performance after failure was obtained by subtracting the attainment score on Set J from the attainment score on Set H. Attributional scales were completed after Set I, the failure experience. Finally, a third set of anagrams, again matched for familiarity with those used previously, was administered. (Appendix 6.3)

Manipulation checks after Sets F and I were conducted. No subjects indicated disbelief in the experimental manipulation.

The female author carried out post-training assessments for the subjects she trained, and the male cohort for the subjects he trained.

All pupils were debriefed after post-training measures were completed. It was explained that failures in Sets B, F and I were contrived and therefore did not reflect on pupils' ability levels.

### Results

This study was designed to examine the effects of an attributional retraining procedure on performance after failure and attributions, the durability of any changes in performance and attributions after 10-14 days, the transfer of any improvement in performance from an arithmetic to an anagram task, and to consider the influence of the sex of the trainer on the effectiveness of training. Parametric procedures were used in analysing the results, as for Experiment 2.

The means and standard deviations of scores obtained on the pre-training measures for the initial sample and the 44 subjects selected for attributional retraining appear in Table 9.1.

Subjects were selected for training on the basis of impaired performance after failure (i.e. positive A-C

TABLE 9.1

Means and standard deviations of scores  
on pre-training measures for the initial sample,  
and subjects selected for attributional retraining

		Initial Sample  (N=95)	Selected Subjects		
			Male Trainer (N=22)	Female Trainer (N=22)	Total  (N=44)
<hr/>					
Deterioration in Performance after Failure <sup>a</sup>		M 1.56 SD 3.47	2.77 1.68	4.36 2.82	3.57 2.43
Attributions for Failure <sup>b</sup>					
	Luck	M 3.19 SD 1.72	3.68 1.61	3.18 1.76	3.43 1.69
	Difficulty	M 3.28 SD 1.86	3.09 1.54	3.59 2.20	3.34 1.89
	Effort	M 3.84 SD 2.05	3.91 2.09	3.91 2.05	3.91 2.04
	Ability	M 3.88 SD 2.05	4.09 1.95	3.23 1.66	3.66 1.84
Response to 'Mitigating Circumstance' <sup>c</sup>		M 2.72 SD 3.65	3.36 1.73	6.55 3.20	4.95 3.01
Anagrams		M 22.94 SD 6.86	22.23 6.78	22.86 7.13	22.55 6.88

<sup>a</sup> Difference between attainment score on Set A and attainment score on Set C

<sup>b</sup> Range = 1 (not important at all) to 7 (very, very important)

<sup>c</sup> Difference between attainment score on Set A and attainment score on Set D.

scores), and no improvement in performance under a 'mitigating circumstance' (i.e. positive or zero A-D scores). By definition then, the selected subjects had significantly higher A-C scores ( $t(93) = 6.20, p < .001$ ) and A-D scores ( $t(93) = 6.75, p < .001$ ) than the remainder of the sample. These were the only pre-training variables on which the selected and unselected subjects differed.

Table 9.2 shows the mean scores and standard deviations obtained during the two post-training assessments, immediately and 10 - 14 days after training, for the male and female trainer groups.

The effect of training on attributions and performance after failure were examined using analysis of variance for repeated measures with one between groups factor (sex of trainer), and testing for an interaction between sex of trainer and change in performance after failure from pre-test to the two post-tests.

#### Sex of Trainer

No significant effects for sex of trainer were found (whether the trainer was male or female had no influence on the success of the intervention in producing performance change ( $F(2,80) = .86, p > .05$ ) or attributional change (Luck:  $F(2,80) = 1.72, P > .05$ ; Effort:  $F(2,80) = 0.54, p > .05$ ; Ability:  $F(2,80) = 2.82, p > .05$ ; Difficulty:

TABLE 9.2

Means and standard deviations of scores  
on post-training measures immediately  
and 10-14 days after training

		Male Trainer (N=22)		Female Trainer (N=22)		Total (N=44)	
		Immediate	Delayed	Immediate	Delayed	Immediate	Delayed
<hr/>							
Deterioration in Performance after Failure <sup>a</sup>							
	M	1,91	-,05	2,55	-,09	2,23	-,07
	SD	3,46	3,47	4,52	2,93	4,12	3,30
Attributions for Failure <sup>b</sup>							
Luck	M	3,73	3,64	3,87	4,14	3,80	3,89
	SD	1,79	1,47	1,85	1,54	1,82	1,57
Difficulty	M	3,60	3,64	3,86	3,55	3,73	3,59
	SD	1,78	1,52	1,42	2,03	1,56	1,81
Effort	M	4,91	3,82	5,05	4,50	4,98	4,16
	SD	1,78	1,49	1,44	2,07	1,72	1,79
Ability	M	3,51	3,96	3,00	3,37	3,25	3,66
	SD	1,81	1,36	1,85	1,85	1,83	1,63
Anagrams	M	30,55	35,73	22,19	24,10	26,36	29,91
	SD	9,96	8,21	7,46	11,60	9,84	11,59

<sup>a</sup> Difference between attainment score on Set E and attainment score on Set G for immediate post-test, and attainment score on Set H and attainment score on Set J for delayed post-test.

<sup>b</sup> Range = 1 (not important at all) to 7 (very, very important)

$F(2,80) = 1.63, p > .05$ ). (Appendix 7.5)

Subjects assigned to male and female trainer groups differed at pre-testing on A - C scores, with failure disrupting the performance of subjects in the female trainer group to a greater extent than the performance of subjects in the male trainer group ( $t(42) = -2.27, p < .05$ ). Because of this, the influence of the trainer's sex on performance after failure (E - G and H - J scores) was again examined using analyses of covariance, with A - C scores as the covariate. These analyses again showed sex of the trainer to have no impact on the effectiveness of training in reducing impairment after failure at either immediate ( $F(1,41) = .14, p > .05$ ) or delayed post-testing ( $F(1,41) = 0.11, p > .05$ ). (Appendix 7.6)

#### Maintenance

Table 9.3 shows the mean scores obtained at pre-testing, immediate and delayed post-testing, (combining the scores for the male trainer and female trainer groups) and the results of the repeated measures analysis of variance. (These are given in full in Appendix 7.5)

A highly significant Occasions effect for performance after failure was noted ( $F(2,80) = 17.17, p < .001$ ). Planned comparisons showed an improvement in performance

Table 9.3

Mean scores obtained at pre- and post-training assessments, (combining scores for male trainer and female trainer groups) and results of Analysis of Variance assessing differences between occasions.

	Pre- Training	Immediate Post- Training	Delayed Post- Training	F	P
Deterioration in Performance after Failure <sup>a</sup>	3.57	2.23	-.07	17.17	P< .001***
Attributions for Failure <sup>b</sup>					
Luck	3.43	3.80	3.89	1.55	P> .05
Difficulty	3.34	3.73	3.59	.10	P> .05
Effort	3.91	4.98	4.16	5.22	P< .01**
Ability	3.66	3.25	3.66	1.42	P> .05
Anagrams	22.55	26.36	29.91	22.52	P< .001***

<sup>a</sup> Difference between attainment score on Set E and attainment score on Set G for immediate post-test, and attainment score on Set H and attainment score on Set J for delayed post-test.

<sup>b</sup> Range = 1 (not important at all) to 7 (very, very important)



after failure immediately after training ( $F(1,40) = 6.17$ ,  $.05 > p > .01$ ). There was an even greater improvement when performances on the two post-tests were compared ( $F(1,40) = 11.33$ ,  $p < .01$ ). (This indicates that the results are not due to regression towards the mean as a consequence of random error in testing, which may happen if an extreme group is selected and retested.)

Thus, the training was effective in reducing the amount of impairment in performance after failure. Ten of the 44 subjects actually performed better after failure than before, at immediate post-testing. This effect appeared to strengthen in the fortnight following training to a point at which 19 subjects performed better after failure than before (see Figure 9.1).

With regard to attributional ratings, the only significant Occasions effect found was for effort ( $F(2,80) = 5.22$ ,  $p < .01$ ). Planned comparisons showed a significant increase in the amount of emphasis placed on effort as a cause of failure between pre-testing and immediate post-testing ( $F(1,40) = 8.05$ ,  $p < .01$ ). At delayed post-testing the amount of emphasis on effort tended to decrease to a level which was not significantly different from that noted at pre-testing ( $F(1,40) = .59$ ,  $p > .05$ ). (See Figure 9.2).

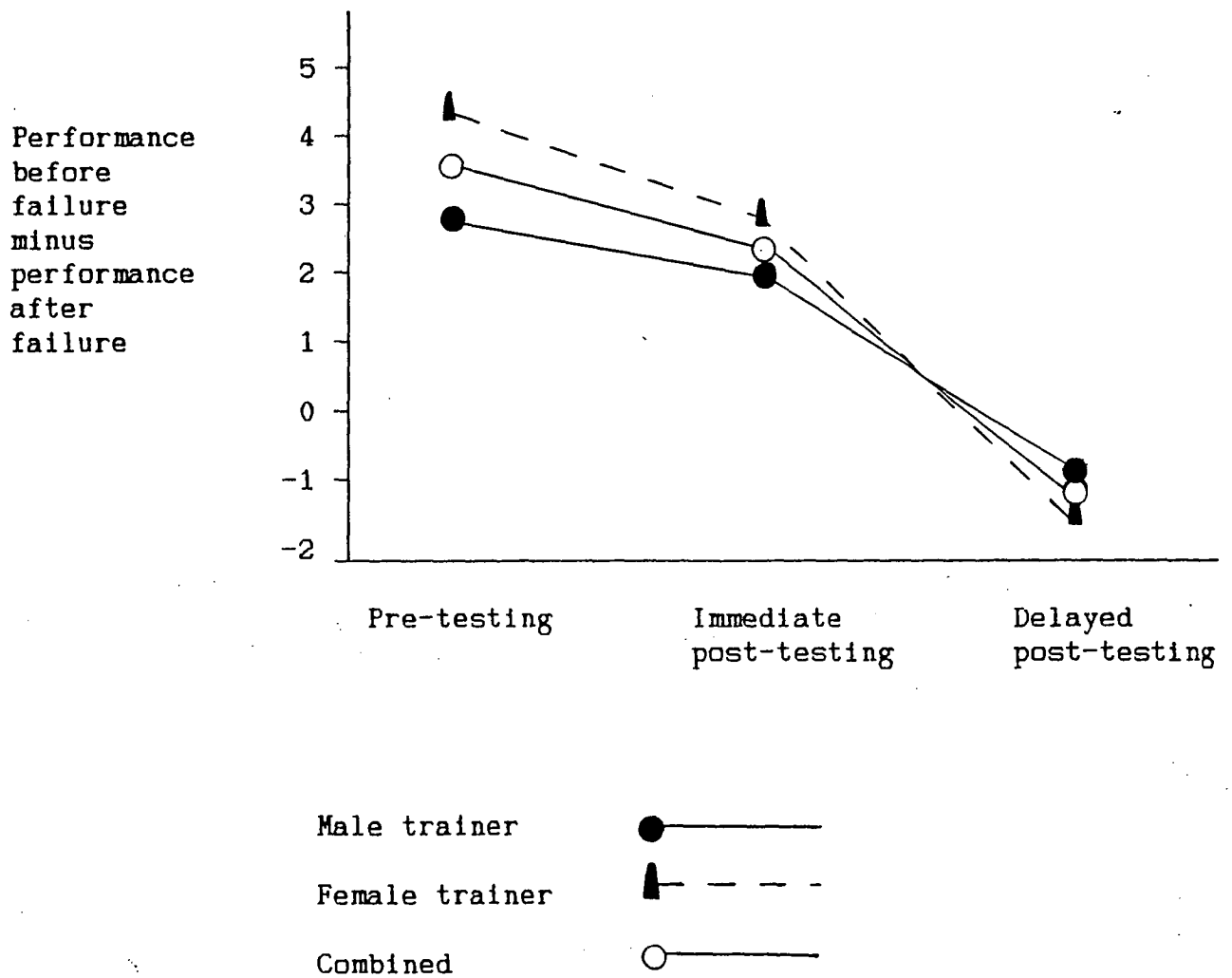


Figure 9.1 : Effect of training on deterioration in performance after failure

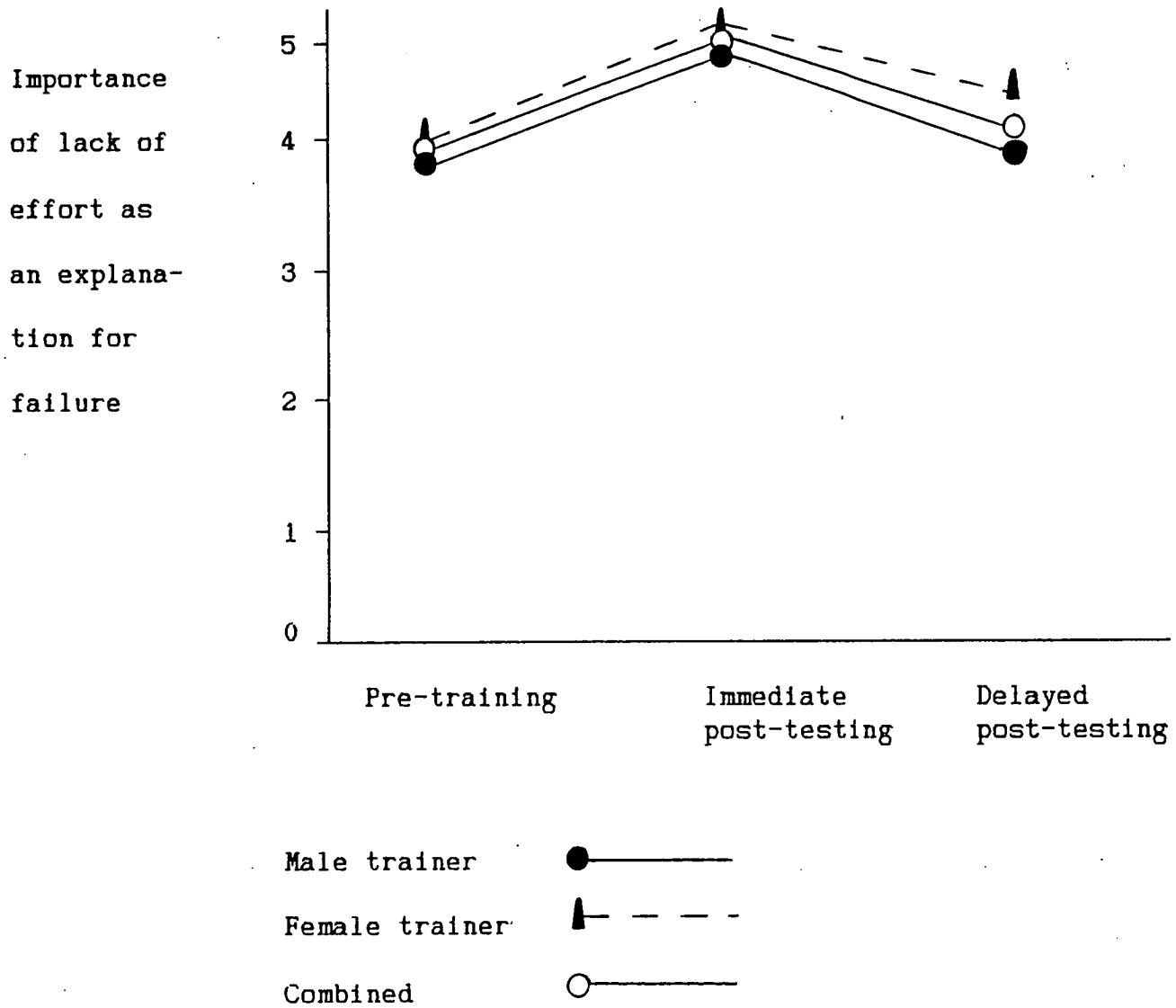


Figure 9.2 : The effect of training on effort attributions

### Generalisation

With regard to the issue of generalisation from the arithmetic task used in training to the anagram task, a significant main effect for Occasions was noted in overall comparisons of anagram scores ( $F(2,80) = 22.52, p < .001$ ). Planned comparisons showed a significant improvement in anagram scores between pre-testing and immediate post-testing ( $F(1,40) = 14.87, p < .001$ ), and again between immediate and delayed post-testing ( $F(1,40) = 11.96, p < .01$ ).

### Discussion

The results of this study again showed that an attributional retraining technique with an observational learning component can reduce impairment after failure for subjects classified as learned helpless. The technique not only inoculated students against the experience of failure, but in a number of cases resulted in improved performances after failure, replicating the findings of Experiment 2. The demonstrated efficacy of vicarious attributional retraining is also consistent with the findings of Experiment 1, and previous research (Gerling et al, 1981; Zimmerman and Ringle, 1981; Zoeller et al, 1983).

The improvement in performance after failure was apparent immediately after training and showed a further

strengthening a fortnight later. Training effects were not related to the sex of the trainer.

The findings pertaining to attributional change are less clear cut. Immediately after training there was an increase in the amount of emphasis placed on lack of effort as a cause of failure. This is to be expected since the intervention encouraged subjects to explain their performances in terms of the application of effort, and it parallels the results of Experiment 2. However, a fortnight after training the amount of emphasis placed on effort had subsided to much the same as the pre-training level.

This throws into question the proposed role of effort attributions in mediating responses to failure. As was suggested in the discussion of the previous study's results, it is possible that the improved performances after failure were unrelated to attributional change, but occurred because of subjects' compliance with the instruction to try harder, which may be implicit when subjects are encouraged to ascribe failure to lack of effort. The further improvements in performance after failure apparent at delayed post-testing may have been the result of some other, as yet unspecified, intervening variable such as self-esteem: i.e. at immediate post-testing, compliance with the instruction may have resulted in improved performance after failure; and this, in turn, may have enhanced self-esteem which mediated

the continued improvement a fortnight later. Alternatively, it is possible that the increased emphasis on effort did mediate improved performance at immediate post-testing, and that this led to increased self-esteem which then brought about further performance improvements as outlined above, despite the decline of effort attributional ratings.

Attributional ratings for ability did not alter during the duration of this study. This is in contrast to the findings of Experiment 2 which showed a post-training increase in effort ratings and corresponding decrease in ability ratings. Possibly ability ratings did not alter after training in the current study because in the first instance subjects did not construe inability as a particularly important cause of failure. This is suggested by the mean ability rating at pre-test, which in Experiment 2 was 6.05, but in Experiment 3 was 3.88. For the subjects in Experiment 3 there was a highly significant correlation between ability rating at pre-test and change in ability rating between pre-test and immediate post-test ( $r = .58$ ,  $p < .001$ ), indicating that those subjects who initially emphasised lack of ability as an explanation for failure were more likely to rate it less highly after training.

Performance after failure improved regardless of initial ability ratings, and unaccompanied by changes in ability ratings. This suggests that ability attributions do

not mediate responses to failure. Furthermore, the learned helpless subjects selected for intervention in this study could not be discriminated from their unselected peers on the basis of ability ratings. This is inconsistent with the notion that learned helpless students show detrimental responses to failure because they believe they are incapable of achieving success.

Regardless of the mechanism of change, it is clear that change did occur and was sustained over a two week follow-up period. Moreover, there was a corresponding improvement in performance on a transfer task. While it is possible that this is the result of practice, it may well be due to a generalisation of treatment effects, i.e. subjects trying harder and therefore performing better on the anagram task after training.

In the next chapter, the findings of Experiments 1, 2, and 3 are discussed at greater length.

## CHAPTER 10

## DISCUSSION



## CHAPTER 10

### DISCUSSION

This series of studies shows that attributional retraining via observational learning is effective in inoculating some students against failure. There is initial evidence that this effect persists a fortnight after training and generalises to a transfer task, and that it occurs regardless of the sex of the trainer.

Students selected for intervention were those who performed more poorly after failure than before (Experiments 1 and 2), and whose performance did not improve under conditions designed to remove the denigrating implications of failure (Experiment 3). It is not clear from the current investigation whether attributional retraining is a more suitable intervention for some of these selected students than for others. In Experiment 1, females responded more positively to training than males. However, in Experiment 2, which employed a different training technique (although still a form of attributional retraining via observational learning), no sex differences were apparent. The findings of Experiment 2 suggest that students classified as learned helpless are more likely to benefit than those classified as motivated by a desire to protect self-worth. Yet,

inconsistent findings regarding attributions throw into doubt their proposed role in mediating performance, and also the appropriateness of the term learned helpless when applied to selected subjects.

The efficacy of the intervention in the production of behavioural change is first discussed in this chapter. Considered next are its efficacy in producing cognitive change, and the ensuing implications for the nature and measurement of attributions, and theories of learned helplessness and self-worth protection. Discussion of sex differences in these experiments precedes a concluding section on practical implications and directions for future research. Methodological problems which limit the findings will be considered throughout the discussion, when appropriate.

#### Behavioural Change

The findings of all three studies support the central hypothesis that attributional retraining with an observational learning component will limit the effect of failure on performance. This was shown to occur using two different procedures:

- (i) observation of a film in which a model's successes and failures were related to effort, and the model was rewarded with a token and praise for successes; and

- (ii) participation in a group maths game in which subjects threw dice for a chance to complete a sum, and were verbally reinforced for attributions relating its correctness or otherwise to the application of effort.

In Experiments 2 and 3, the intervention reduced the amount of impairment in performance after failure. For some students the intervention appeared to impart to failure a motivating effect, resulting in performances which were better after failure than before. This occurred for 72% of subjects classified as learned helpless in Experiment 2, and 23% of subjects in Experiment 3 at immediate post-testing and 43% at delayed post-testing.

Such remarkable improvements replicate the findings of Dweck (1975). In her original study, she demonstrated that a number of extremely helpless children who were taught to attribute their failures to a lack of effort, began to show performances after failure which were superior to their performances prior to failure. The new responses to failure after training are also reminiscent of the behaviour of mastery-oriented children who appear to perceive lack of success as a cue for greater effort: they tend to invest their energies in actively pursuing solution-relevant strategies, and maintain or increase the sophistication of these strategies in the face of failure (Diener and Dweck, 1978).

The improvements occurred despite the problem highlighted by Weiner (1983), who warned of the difficulties involved in inducing subjects to believe that their failures are due to a lack of effort. In experimental situations, subjects are typically fully engaged in the tasks before them, and a mismatch between their actual experience and attributional feedback may result. This problem may have been partially overcome in this series of studies because subjects were not told directly that their failures were related to lack of effort. In Experiment 1, the attribution-performance connection was made explicit by reference to a model's behaviour; and in Experiments 2 and 3, appropriate spontaneous attributions were verbally reinforced by the Experimenter.

A related issue concerns the subjects' acceptance of the Experimenter's intention of failure on the tasks specifically designed for this purpose (i.e. Experiment 1: Sets B and E; Experiment 2: Sets B and F; Experiment 3: Sets B, F and I). The possibility exists that some children may have 'opted out' or become less persistent after these sets because they felt they were being duped by the Experimenter. This is particularly so in the first experiment in which Sets B and E contained unsolvable problems. None of the subjects in this experiment indicated that they felt they were being misled by the Experimenter when they were presented with consecutive red lights, implying that they had accepted their performances as failures. However, some subjects may still have had

suspicions about the unsolvable nature of the problems and 'opted out' because of these.

An attempt to overcome this drawback was made in the two subsequent studies in which the failure sets were comprised of sums designed to be just beyond the capability level of subject (but not unsolvable). Subjects achieved correct answers on approximately a third of these, but indicated that overall they made more mistakes than gave correct answers. It seems unlikely that subjects would have perceived this situation to be unrealistic or themselves to have been duped.

In Experiment 3, the improvements in responses to failure continued beyond the immediate post-training period and were even greater 10 to 14 days after training. This is the first evidence of a durable effect arising from vicarious attributional retraining. However it is unlikely that long-standing individual differences in accomplishment will be overcome by manipulations which produce only short-term change. Thus it is important to consider in future research both the likely course of events beyond the two-week period, and the real life significance of the gains made.

### Cognitive Change

Diener & Dweck (1978), assert that learned helpless and mastery-oriented children show different responses to failure because they possess different constellations of achievement-

related cognitions, with the former perceiving failure to be inevitable and insurmountable and reflective of their lack of ability, and the latter believing their successes to be replicable and their mistakes rectifiable. Similarly, Weiner's theory of achievement motivation assumes that impaired performances after failure are mediated by attributions to inability which lead to reduced success expectancy, and negative emotions. It is the modification of the attributional style that is considered to be the crucial ingredient in attributional retraining.

The attributional results from Experiments 1 and 2 are essentially consistent with this cognitive approach. In Experiment 1 there was a strong positive correlation between persistence after failure, and IARS scores which reflected as emphasis on the role of effort in failure. In Experiment 2, subjects classified as learned helpless on the basis of performance also displayed an attributional style associated with learned helplessness, i.e.; they rated lack of ability as a more important cause of failures than subjects classified as self-worth motivated. Further, after training, learned helpless subjects showed a decrease in ability ratings and an increase in effort ratings.

The attributional results from Experiment 3 are not consistent with the framework presented. In this study learned helpless subjects rated ability no more highly than

the rest of the sample from which they were selected. Their ability ratings did not alter after intervention, despite improvements in performance after failure; and performance after failure continued to improve at delayed post-testing while effort ratings subsided. These findings do not support the notion that attributions are the mediators in the process of behavioural change, as predicted by the cognitive approach.

### The Nature of Attributions

The cognitive approach proposes that attributions impact on motivated behaviour such as persistence and choice via their influence on success expectancy and affect. In contrast, the motivational approach suggests that attributions represent an 'a posteriori' justification of behaviour in which attributions are put forward to explain behaviour because of their value in protecting self-worth, not in providing a valid causal analysis. Much of the evidence in support of the former position, including that derived from Experiments 1 and 2 of this thesis, is correlational in nature indicating that attributions and performance co-vary (e.g. Andrews & Debus, 1978; Dweck & Reppucci, 1973; Stipek & Weisz, 1981; Uguroglu & Walberg, 1979). Difficulties in establishing clearly the causal influence of attributions on subsequent performance may in part reflect the complexity and inaccessibility of the attributional process. It is possible that past research has been guilty of simplifying this process and failing to recognise accessibility problems.

It has been proposed (Mandler, 1975; Miller, 1962) that people have little or no direct introspective access to higher order mental processes. This was supported in a review of research by Nisbett and Wilson (1977) who concluded that subjects are sometimes unaware of the existence of their evaluative and motivational responses to manipulations in attribution and dissonance studies, are unable to report that a cognitive process has occurred, or are unable to report accurately about the effect of a stimulus on their responses.

Such conclusions imply that people are unable to report correctly about why they behaved in a particular way, and therefore that their attributions do not represent a valid causal analysis. Nisbett & Wilson (1977) suggest that when people are asked to describe the influence of a particular stimulus on a particular response, they do not consult a memory of the mediating process, but apply or generate causal theories about the effect of that type of stimulus on that type of response. When asked to account for a failure, the individual puts forward an a priori causal explanation which he judges to be plausible. This explanation may be embedded in the individual's culture or subculture, or may be idiosyncratic, such as a strongly held belief (or schema) that "My failures are due to my lack of ability." From this point of view, attributions represent an a priori acceptance of familiar causal theories.



If attributions do not mediate performance, then the term attributional retraining may well be a misnomer. Two important questions arise from this tentative conclusion:

(1) If not attributional change, what is the crucial ingredient in producing improved responses to failure? Would subjects have demonstrated the same improvement if simply told to try harder?

(11) Did any cognitive change (other than the rise and fall of effort ratings) accompany the improved performance? This question relates to the durability of improved performance, since it seems unlikely that any behavioural change will be sustained in isolation from cognitive change.

Consideration of effort calculation theory (Vollmer, 1986) may provide some answers to these questions. According to the effort calculation hypothesis, before performing an achievement related activity, a person calculates success expectancies for different possible levels of effort expenditure, taking into account task difficulty and perceived ability. Success expectancy in turn influences quality of performance via actual effort expenditure. Clearly, this is similar to Weiner's approach, although it places central emphasis on the role of expectancies, and could explain the results of Experiment 3 in the following manner: pre-training

failure experiences acted to decrease the subjects' expectancies of future success. The training procedure, implying that success is obtainable by hard work, acted to increase expectancies. Subjects who expected greater success, expended more effort and thus improved the quality of their performance. This improvement 'per se' had the effect of maintaining a high success expectancy at delayed post-training assessment, reflected in continued improvements in performance after failure. From this point of view, expectancy of success, not attributional change, is considered to be the crucial mediating factor in the process of performance improvement. It is possible for attributions to effect performance through their influence on success expectancy, but importantly success expectancy is influenced by a host of variables in addition to attributions, such as previous performances. If success expectancy changes through the influence of one of these additional variables, then performance change can occur either

- (1) in the absence of attributional change, or
- (11) as seems more likely, because of the influence of expectancy on attributions, accompanied by attributional change, but without being caused by it.

Clearly, the current studies would have been enhanced by the inclusion of a measure of expectancy and future research should focus on investigating further the relationships

between attributions, expectancy and subsequent academic achievements.

There are two other possible explanations for attributional inconsistencies. The first of these relates to measurement issues, and the second to subject selection.

#### Measurement of Attributions

There are difficulties inherent in the measurement of attributions and attributional style. In particular, the experimental setting may render the attributional process vulnerable to demand characteristics, making it difficult for subjects to admit their true thoughts about the experimental manipulation. In addition, any methodology other than open-ended questioning, may not allow subjects to indicate what they perceive to be an accurate causal analysis. In Experiment 1, the IARS was used as an index of general attributional style. In Experiments 2 and 3, more specific scales were constructed to index explanations for outcomes on the experimental task. These scales required subjects to rate the causal importance of each of the four factors identified by Weiner (1979) as most salient in achievement outcomes (task difficulty, luck, ability and effort). By limiting measurement to these four factors, others such as mood, strategy and the role of other people, are ignored. In defence of the methodology, must be considered the large body of evidence indicating Weiner's four factors, particularly

effort and ability, to be the most salient with regard to academic performance (Burger et al, 1982; Elig and Frieze, 1979; Frieze, 1976; Frieze and Snyder, 1980; Willson and Palmer, 1983). However, it is possible that inconsistencies between performance and attributions were due to the measurement scales which did not allow the subjects to give their 'real' explanations for failure. (Again, why this occurred in Experiment 3 and not in Experiments 1 and 2 is unclear.)

#### Subject Selection

Issues related to subject selection may explain inconsistencies between the post-training attributions of learned helpless subjects in Experiments 2 and 3.

It is possible that subjects selected for intervention in Experiment 3 are not accurately described as learned helpless. Despite the fact that the same selection procedures were used as for Experiment 2 (impairment in performance after failure and no improvement under a mitigating circumstance), pre-test attributional ratings varied considerably between the two studies. Prior to any intervention, subjects in Experiment 3 rated ability as a much less important cause of failure than their counterparts in Experiment 2.

Kramer & Rosellini (1984) note that the concept of learned helplessness is frequently misapplied to children whose performance deficits may be due to stress or fatigue rather than the perception of noncontingency, or to children whose performance only appears to be deficient. To illustrate this, they divided 84 Grade 5 and 6 subjects into three groups: a control-waiting group, and groups which experienced contingent or noncontingent success on a button-press task. When subsequently tested on a Levine cognitive problem-solving task, the contingent success group performed better than their noncontingent peers, leading initially to the conclusion that the latter group were learned helpless. However, comparison with the control group indicated the difference to be the result of a facilitation effect of contingency, rather than a performance deficit. This indicates that care is required in the application of the term learned helpless and in the absence of a triadic design as used by Kramer and Rosellini (1984), validity may be enhanced by taking into account both performance and attributional style in the selection of learned helpless subjects.

Thus, subjects in Experiment 3 may have shown a different pattern of attributions to those in Experiment 2 because they were not learned helpless, or at least did not perceive inability as an important cause of their failures.

Cognitive versus Motivational Explanations of Impaired Performance after Failure.

Experiment 2 was designed to elucidate cognitive versus motivational explanations of impaired performance after failure, by distinguishing between those children whose deteriorated performance after failure was a consequence of learned helplessness and those whose performance was motivated by self-worth considerations.

These two groups of children did not differ in the extent to which failure disrupted performance prior to training, or in self-esteem. Both groups had lower self-esteem than their peers whose performances were not impaired after failure. This is consistent with research showing low self-esteem subjects to be more affected by repeated failure than their more confident peers (Brockner, 1979, a,b; Covington and Omelich, 1981) and that self-esteem is positively associated with persistence at difficult tasks (Shrauger and Sorman, 1977).

However, they did differ in attributions and response to training. The learned helpless group rated lack of ability as a more important cause of failure prior to training, and after training found failure to be less disruptive and placed less

emphasis on lack of ability as an explanation, than the self-worth group.

These findings tend to support the notion that there were, in this experiment, at least two separate groups of children suffering impaired performance after failure.

It is not clear whether these two groups will demonstrate consistency in their behaviour and attributional responses to failure and mitigating circumstances in different contexts. Learned helplessness theory originally proposed attributional style as a trait-like concept. However, cross-situational consistency in behaviour and attributions has yet to be clearly established (eg. Frieze and Snyder, 1980; Mischel, 1973). Thus it is possible that those subjects classified as learned helpless may in other circumstances act to protect self-worth, and similarly that subjects classified as self-worth motivated may, under certain conditions, manifest learned helplessness.

It is also possible that under certain circumstances, subjects who were not selected for intervention will display behaviour indicative of learned helplessness or self-worth protection. According to Covington (1986), because the "dominant ability diminution is common to all individuals" (p.260) everybody has the potential for such behaviour, not only those with a certain attributional style, predisposition

or level of self-esteem. He proposes that a continuum exists between unimpaired performance after failure, self-worth protection and learned helplessness : after an initial failure, the individual either views the subsequent task as a challenge or begins self-worth manoeuvring. As repeated failures occur and attempts to avoid the implication of low ability are unsuccessful, the individual experiences anxiety, loss of personal control, depression and helplessness. This suggests that if the experience of failure had been extended in Experiment 2, subjects not selected for intervention because their performances were unimpaired after failure may have begun to show self-worth protection, and subjects identified as protecting self-worth may have begun to show helplessness. Covington's proposal does not throw any light on the distinctions between those who find initial failure a challenge and those who find it a trigger to self-worth manoeuvring.

Dweck and Leggett (1988) suggest that only a certain sub-population is predisposed to show helplessness or self-worth protection. These are individuals who construe intelligence as a fixed entity (i.e. 'entity theorists'). These people are concerned with proving their ability and avoiding giving evidence of its shortcomings. They operate on the principle of inverse compensation, in which effort expended can be used as an index of ability level. In contrast are the 'incremental theorists' who view intelligence



as malleable and are concerned with increasing their competence and improving their ability. For these individuals, the expenditure of much effort to achieve success does not indicate low ability but allows them to use and make manifest greater ability. 'Incremental theorists' are likely to show mastery-oriented behaviour and find initial failure a challenge, but according to Dweck and Leggett (1988), will not feel the need to protect self-worth or be vulnerable to learned helplessness.

Underlying research designed to distinguish between the cognitive and motivational approaches to impaired performance after failure are the assumptions that there is a clear conceptual distinction between cognitive and motivational determinants of attributions, and that through experimentation it is possible to choose between the two positions. Tetlock and Levi (1982) challenge these assumptions. For example, they claim that cognitive theories can assimilate findings of motivated bias in attributions by ascribing it to some combination of stimulus encoding, analysis and decoding rules employed by the perceiver, but as yet unknown. Thus the attributions of self-worth subjects in Experiment 2 may have been the result of logical causal analysis, but a different causal analysis to that of learned helpless subjects. Alternatively, cognitive explanations can also be interpreted in terms of motivational bias. The search for logical causal explanations or cognitive mastery may be construed as the

result of motivation for inconsistency reduction (Tannenbaum, 1968). Thus the learned helpless subjects may also have been making attributions as a result of a motivational process, but using different motives to those of self-worth subjects.

Because of such problems, Tetlock and Levi (1982) have argued that between-theory confrontation is premature and must be preceded by identification and clarification of conceptual ambiguities in both the cognitive and motivational positions. Individual and situational factors which influence the attributional process have been paid only scant attention but clearly warrant closer scrutiny. Such information will enable an understanding of the circumstances in which the need to protect self-worth will override a learned helpless attributional style and vice versa, and prediction of the characteristics which make certain individuals more prone to learned helplessness or self-worth protection.

### Sex Differences

In general the predicted sex differences were not apparent in the results of Experiments 1 and 2. (This led to a single-sex subject population in Experiment 3).

In Experiment 1,

- (1) boys and girls differed on IARS scores with girls showing relative neglect of the effort factor in

explaining outcomes. This is consistent with studies showing that females cite external factors more than males (eg. Bar-Tal and Frieze, 1977; Deaux and Harris, 1977; Feather, 1969; Frieze and Bar-Tal, 1980; Simon and Feather, 1975) and that males are more inclined to blame lack of effort than females (Dweck and Repucci, 1973).

- (11) However, boys were not more persistent than girls prior to training, and girls were not found to be more vulnerable to the learned helplessness induction procedure, contrary to the findings of Dweck and Gilliard, 1975; Dweck and Reppucci, 1973; Gody, 1978; Le Unes et al, 1980; Maccoby, 1966; Nicholls, 1975; Veroff, 1969; Welch and Huston, 1982; Wilson et al, 1980. (None of these studies cited has been conducted in Australia, raising the possibility of cross-cultural effect.)

The results are consistent with those of Eccles et al (1984) who found some sex differences in paper and pencil measures of junior high school students' attributions for maths outcomes and success expectancies during failure trials; but no sex difference in actual behaviour.

- (111) Attributional retraining was effective in improving responses to failure of girls, but not boys. In

the discussion following this study two possible explanations were advanced: the exchange theory analysis of achievement behaviour (Wyer and Bednar, 1967), and self-worth theory.

In Experiment 2, there were no sex differences in attributions (with the exception of luck which girls rated more highly), responses to failure or responses to attributional retraining.

Subjective task value appears to be a powerful mediator of sex differences in achievement-related behaviours and plans (Eccles et al, 1984), with females being more positively biased towards English and less towards Maths than males at junior high school level. Eccles et al found that the influence of subjective task value was even greater than that of confidence in academic ability, on plans and decisions regarding enrolment in Maths and English courses. Furthermore, they found that Maths is considered to be a more difficult subject than English, and that Maths performance is considered to be more strongly influenced by ability than English performance. Dweck and Licht (1980) have argued that this and other features of Maths tasks combine to make them debilitating and unappealing to helplessness-prone individuals.

Tasks employed in Experiments 1 and 2 were pattern completion (relying on non-verbal intelligence), and arithmetic problems. These are male-oriented tasks, arguably with lower subjective value for females than males. Yet in neither experiment did males display greater persistence than females. It is interesting to note that in Experiment 3, which also employed arithmetic problems, there was some evidence of a transfer effect from this male-oriented task to the more female-oriented anagram task.

As noted in Chapter 5, it has been proposed that sex differences in persistence and attributions are partially the result of teacher feedback which discourages boys to view failure as indicative of low ability, especially when feedback is given by female teachers (Dweck and Bush, 1976). In the three studies in this investigation, male teachers had either total or 50% responsibility for the classes from which the subjects were drawn. It is possible therefore that the contingencies assumed to promote sex differences in helplessness were not in existence, or were diminished in their effectiveness. Since female teachers predominate in primary schools, and since generalised attributions for failure are presumed to mediate sex differences in long-term academic achievement, the issue of differential feedback styles clearly warrants further investigations.

The proposition that failure feedback from a female adult produces greater impairment in performance after failure than similar feedback from a male (as found by Dweck and Bush, 1976) led to the comparison in Experiment 3 between male and female trainer. In this instance, the trainer's sex was found to have no influence on the effectiveness of training. However, this issue clearly needs to be examined in a more rigorous fashion.

### Conclusion

It is clear from the preceding discussion that in this complex area of research which seeks to establish connections between such esoteric constructs as motivation, cognitions and achievement, many questions remain unanswered. Although the relevance of attributional theory is well established, it is the complexity of the area which has resulted in relatively slow progress in the development of attributional therapies (Brewin, 1988).

Further research should be directed towards identifying the effective components in attributional retraining procedures, and assessing their long-term impact in real-life settings. Refining instruments for the measurement of attributions would enhance the ease with which such studies can be compared and replicated. Investigations of further distinctions between helplessness and self-worth protection may indicate the extent to which these behaviours are

influenced by individual predispositions, such as a particular view of intelligence, and situational factors, such as the extent of failure experienced.

Despite these unanswered questions some general directions are available for preventing students from responding to failure with impaired performances. Teachers need to be aware of students' attitudes towards mastery and failure, and endeavour to create classroom settings which are tolerant of error making. They should reinforce the choice of difficult tasks, reward solution-seeking rather than the attainment of success, and minimise threat and punishment for failure. This approach should be accompanied by a realistic understanding of each student's capabilities.

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## APPENDIX 1

### PUBLICATIONS

## IMPROVING PERSISTENCE THROUGH OBSERVATIONAL LEARNING AND ATTRIBUTION RETRAINING

By M. L. CRASKE  
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**SUMMARY.** This study aimed to improve the persistence of learned helpless children through reattribution training accomplished via observational learning. In addition, the relationships of effort attributions and intelligence to persistence behaviour were examined. In the initial phase, 65 Grade 5 and 6 subjects were presented with unsolvable puzzle-completion problems to gauge persistence levels; they also completed the Intellectual Achievement Responsibility Scale (IARS), and Raven's Progressive Matrices. IARS scores which reflected neglect of the effort factor in academic outcome correlated highly with persistence; intelligence scores were not related to persistence. In the second phase, the 32 least persistent subjects were assigned to control or vicarious reattribution training groups. The treatment was associated with increased persistence in female, but not male, subjects. The results are discussed in terms of exchange theory analysis and self-worth theory.

### INTRODUCTION

THE understanding of persistence behaviour and other aspects of school achievement has been considerably advanced by the application of concepts drawn from attribution and learned helplessness theories. The general attributional approach to motivation developed by Weiner and his colleagues (e.g., Weiner, 1972, 1979) asserts that the causal beliefs people hold about their successes and failures have important consequences for their subsequent feelings, expectancies and behaviour. Learned helplessness is a specific instance of this general formula. It occurs when an individual believes he lacks control in obtaining desired outcomes, and when he believes the cause of his lack of control is an internal, stable and global factor. The consequences of such beliefs include diminished self-esteem, low success expectancy and deterioration in performance (Abramson *et al.*, 1978).

These concepts have been used to explain the deteriorated academic performance and reduced persistence levels of some students after repeated failure (e.g., Dweck and Reppucci, 1973; Dweck and Bush, 1976; Andrews and Debus, 1978; Diener and Dweck, 1980). For the student whose responses have consistently failed to produce the desired outcome (i.e., success), the situation appears uncontrollable. As a consequence, the student may become academically helpless. The causal ascription which has been shown to mediate such helplessness is the attribution of failure to lack of ability (Dweck and Reppucci, 1973; Diener and Dweck, 1978, 1980). Since ability is presumed to be relatively unchanging across time and relevant to a wide variety of situations and since its source lies within the individual, it can be described as an internal, global and stable factor. Children who respond to failure with improved performance and an escalation of persistence appear to be guarded against the effects of helplessness by attributing failure to lack of effort (Diener and Dweck, 1978). Effort is an unstable and specific factor. In addition, it is subject to the volitional control of the individual. Effort attributions therefore imply the possibility of better performances in the future and in other situations, and do not reflect on self-worth in the same way that ability attributions do (Butkowsky and Willows, 1980; Stipek and Hoffman, 1980).

Subsequent to recognition of the central role of attributions in achievement behaviour, a number of studies have attempted to improve persistence through attributional modification. Such an approach essentially aims to correct the maladaptive attributional pattern associated with helplessness, by encouraging children firstly

to construe lack of effort as the cause of their failures, and, secondly, to recognise that success is more likely with effort. The efficacy of reattribution training has been demonstrated by Dweck (1975), Andrews and Debus (1978), Fowler and Peterson (1981) and Medway and Venino (1982).

The main purpose of this study is to assess the effectiveness of reattribution training when presented vicariously, rather than individually. There are a number of reasons for selecting observational learning as a potentially valuable means of producing attribution change, and so improving persistence. Firstly, behaviour change through vicarious methods usually occurs within a relatively short time period (Blackham and Silberman, 1975), therefore enhancing the cost-effectiveness of the procedure. Secondly, vicarious methods are generally more effective with observers who are low in self-esteem, highly dependent and incompetent (Blackham and Silberman, 1975). To some extent, these terms are descriptive of the helpless child who blames his own lack of ability for his failure and, though not incompetent generally, does not possess effective strategies to cope with increases in task difficulty. In addition, there is evidence that observational learning can influence those variables relevant to learned helplessness. Bandura (1977) has found modelling to be a successful means of changing self-efficacy expectations in phobic subjects, i.e., of inducing in the observer a belief that he is capable of performing a required behaviour, and therefore that his success in performing the behaviour is due to his own efforts. Brown and Inouye (1978), De Vellis *et al.* (1978), Breen *et al.* (1979), have all demonstrated performance decrements in undergraduate subjects who had not experienced failure. Zimmerman and Blotner (1979), and Zimmerman and Ringle (1981) noted improved persistence in first and second grade children who observed an adult model; the extent of improvement was dependent on the duration of the model's effort or performance, his/her success and his/her statements of confidence.

Ancillary to the central treatment aim of the study, two secondary predictions were made about the features associated with helplessness. In view of the large amount of research showing sex differences in susceptibility to learned helplessness (e.g., Crandall, 1969; Dweck and Reppucci, 1973; Le Unes *et al.*, 1980) and attributional tendencies (Dweck and Reppucci, 1973; Dweck and Bush, 1976; Dweck *et al.*, 1978; Nicholls, 1975, 1979), it was expected that females would demonstrate lower persistence levels than males, and that females would place less emphasis on the role of effort in explaining their failures.

It was also predicted that there would be an inverse relationship between susceptibility to helplessness and intellectual ability. Children whose intelligence lies in the retarded range are more likely to react to failure with reduced persistence than normals (Macmillan and Keogh, 1970; Weisz, 1979). This occurs because retarded children have a history of experiences in which their responses have largely failed to control outcomes, leading them to the conclusion that they are incapable of obtaining desired outcomes, and thus teaching them to be helpless. It seems likely that this paradigm will also apply, to a lesser degree, to children whose intelligence lies at the lower end of the normal range.

### METHOD

#### Subjects

Thirty-seven male and 28 female pupils from two state primary schools near Hobart constituted the initial sample for the study. Mean ages were 10 years 11 months for the girls and 11 years 4 months for the boys. At school A, the subjects were Grade 5 and Grade 6 pupils from a composite Grade 5/6 classroom with a male teacher. At school B, the subjects were drawn from Grade 4/5 and Grade 5/6 composite units each of which shared a male and a female teacher. Only Grade 5 pupils from school

B participated in the study. The catchment areas of both schools are mixed in terms of socio-economic class but include a large percentage of working-class families.

#### *Pretraining measures*

Pretraining assessment consisted of measures of intellectual ability, effort attributions for failure and persistence. The persistence score was obtained by individual assessment; the remaining scores were derived from group administration of questionnaires completed in two sessions on consecutive days.

*Intellectual ability.* This was assessed using Raven's Progressive Matrices (PMS; Australian Council for Educational Research, 1958), a test of non-verbal intelligence. It is a timed test consisting of 60 incomplete designs, which the subject is required to complete by selecting missing sections from multiple choice arrays. Raw scores are converted to intelligence quotients. The Council for Educational Research (1958) has prepared Australian norms covering the range 10 to 18+ years, and reports high reliability scores and adequate validity.

*Effort attributions.* A subscale of the Intellectual Achievement Responsibility Scale (IARS; Crandall *et al.*, 1965) was used to obtain an index of the extent to which lack of effort was construed as a cause of failure. The IARS is a locus of control questionnaire designed to determine the degree to which a child believes that the intellectual failures and successes he/she encounters are a result of his/her own behaviour *versus* the behaviour of important others in his/her environment (such as teachers, parents and friends). It is comprised of 34 forced-choice items each depicting a positive or negative achievement situation and presenting two attributions to choose from: internal, in which responsibility for the outcome is assumed by the subject; or external, in which responsibility for the outcome is relegated to some property of the situation or other person. Crandall (1978) obtained a test-retest reliability of 0.76 for the IARS. Research with the scale indicates that helpless children take less personal responsibility for the outcomes of their behaviour and place less emphasis on the role of effort in determining success and failure than more persistent children (Dweck and Reppucci, 1973; Dweck, 1975; Crandall, 1978). A subscale of 10 items presents negative achievement situations and requires the subject to choose between his/her own lack of effort and an external factor as the causal attribution. Diener and Dweck (1978, 1980) found the subscale to distinguish between helpless and mastery-oriented subjects. In scoring the subscale one point is awarded for each effort attribution with a low score being associated with helplessness.

*Persistence.* An index of persistence, or susceptibility to learned helplessness, was obtained by assessing each subject's performance on a test of 15 unsolvable problems devised by the author. The top row of each problem contained a series of four patterns followed by a blank shape. The subject was required to fill in the blank shape and complete the sequence, by selecting from an array of four patterns given. The patterns were adapted from the Advanced Progressive Matrices, Set II (Raven, 1962). The instructions to each child were as follows:

"We are going to do some puzzles. You will see on the first page of this book five shapes, the last one is blank. You have to find which one of the numbered shapes below fits into the blank space in the top row to follow on the pattern. If you look at the first one you can see that number 1 will fit into the top row to continue the pattern. When you decide which of the numbered shapes is the right one, write your answer on the sheet. Each time you write an answer a light will come on to tell you if you are right or wrong; a green light for right, and a red light for wrong. Don't change your answer if it is wrong, just go on to the next one. I would like you to do at least five puzzles; after that you can stop whenever you like. Close the book when you have finished all the puzzles you would like to do. You can start now."

The red light feedback was incorporated to enhance the salience of the failure result. The Persistence score was obtained by summing the number of seconds spent on items 6 to 15. It was assumed that susceptibility to helplessness would be reflected in shorter times spent on each problem and a willingness to finish the test earlier, thus resulting in a lower Persistence score.

In order to provide some check on the success of the experimental manipulation, after completing the unsolvable problems, subjects were asked, "Do you think you made mistakes because I (the experimenter) was not telling you the truth about whether your answers were right or wrong?" None of the subjects answered affirmatively.

Finally, a set of eight easily solvable general knowledge questions was administered and the subject's success with these was stressed, to ensure that he did not leave the session with a feeling of failure.

The author was assisted by a female undergraduate psychology student, who administered the Persistence measure to approximately half of the subjects.

#### *Selection of helpless subjects*

Pretraining Persistence scores ranged between 0 and 291 seconds for boys, with a mean of 103.05 seconds; and between 0 and 167 seconds for girls with a mean of 78.75 seconds. Subjects who spent less than 80 seconds on the puzzles were selected as being least persistent and most susceptible to learned helplessness. Thirty-two of the 65 subjects fell into this category: 18 or 49 per cent of the boys, and 14 or 50 per cent of the girls. These 32 subjects were selected for participation in the second phase of the study. The sexes were randomly allocated to training and control groups, and paired according to sex, Persistence and PMS scores. (The latter were included in order to account for the possible influence of intelligence on the effectiveness of the training procedure.) Two boys were absent for the second phase, leaving training and control groups each consisting of seven girls and eight boys. The matched groups did not differ significantly on the Persistence ( $t(14) = 0.45$ ,  $P > 0.05$ ) or PMS measures ( $t(14) = 0.29$ ,  $P > 0.05$ ).

#### *Training of helpless subjects*

Training was directed at teaching the helpless subjects to reattribute failure to a lack of effort, rather than a lack of ability, through an observational learning procedure. To this end, an 8-minute training film was made in which a model was seen answering a set of 18 puzzles of the type used in the pretraining Persistence assessment. The model obtained success on these items at a rate of 33 per cent; the successes were arranged in a partial reinforcement schedule, with consecutive failures prior to success. There is evidence that this type of schedule is most effective in overcoming helplessness (Chapin and Dyck, 1976; Nation *et al.*, 1979; Nation and Cooney, 1980; Stein, 1980). The mechanism underlying the procedure's effectiveness is unknown, though possibly interlacing failure experiences with success enhances self-efficacy expectations.

In order to facilitate imitation, the model was rewarded for a correct answer by a green light and a token which could be exchanged for a selection of prizes at the end of the session. She/he was also told, "Good, you have chosen the right answer; that means you tried hard." Following a wrong answer, a red light was displayed and the model was told "That's the wrong answer; that means you should have tried harder."

Female experimental subjects observed a female model, while the male experimental subjects observed a male model. Both models were attractive 11-year-old children unknown to the subjects. Prior to viewing the films, the subjects were told:

"We are going to watch a film that will help you to do your work at school. You

will see a girl (boy) who is very much like you — she (he) doesn't go to this school, but to a school near here, and she (he) is about the same age as you are. This girl (boy) is going to be doing some puzzles. Notice that when she (he) does not try very hard or spend much time on the question she (he) always gets the wrong answer. When she (he) does try hard and spends more time working out an answer she (he) always gets it right. Each time the answer is right she (he) earns a token to swap for a prize afterwards."

The subjects viewed the film for a second time, two days after the first showing. The control group saw two 8-minute excerpts from the television show "The Muppets" in place of the training film.

#### Post-training measure

Post-training assessment was undertaken on the day following the final film viewing. A second Persistence measure was obtained through repetition of the pre-training procedure using alternative, but similar puzzles. Again, the score was derived by summing the number of seconds the subject was willing to spend on items 6 to 15 in the face of consecutive failures, and again, none of the subjects indicated that they felt the experimenter was unreliable when giving failure feedback.

## RESULTS

The predictions under investigation in the first phase of the study, prior to the selection of helpless subjects for intervention, concerned the relationships between persistence behaviour, attributional patterns and general intelligence. The existence of sex differences in persistence and attributional patterns was also the subject of examination. Table 1 presents the mean scores obtained for the variables assessed in the first phase.

TABLE 1  
MEANS AND STANDARD DEVIATIONS OF SCORES ON  
PRETRAINING MEASURES

	Boys (N = 37)		Girls (N = 28)	
	M	SD	M	SD
PMS <sup>a</sup>	104.16	14.46	105.50	14.10
IARS <sup>b</sup>	6.87	1.83	5.32	2.02
Persistence <sup>c</sup>	103.05	66.88	78.75	46.00

<sup>a</sup> Scores represent intelligence quotients.

<sup>b</sup> Maximum score = 10, high scores reflect attributions to lack of effort for failure.

<sup>c</sup> Scores in seconds.

The correlation between Persistence and IARS scores was found to be highly significant for both male ( $r(35)=0.69$ ,  $P<0.005$ ) and female subjects ( $r(26)=0.76$ ,  $P<0.005$ ). This supports the well-established association between willingness to persist in the face of consecutive failures, and an attributional disposition to construe failures as the result of lack of effort.

Intelligence levels, as assessed by the PMS, ranged between quotients of 82 and 134. About 87 per cent of the general population fall into this range (Australian Council for Educational Research, 1958). Those with high scores would be considered to have superior intelligence, and those with lower scores described as borderline (between dull-normal and mental retardation). The relationship between Persistence

and PMS measures was found to be non-significant for male ( $r(35)=0.19$ ,  $P>0.05$ ) and female subjects ( $r(26)=0.22$ ,  $P>0.05$ ). Neither were significant associations found between IARS and PMS scores (Male:  $r(35)=0.02$ ,  $P>0.05$ ; Female:  $r(26)=0.12$ ,  $P>0.05$ ). It appears that intelligence, when lying essentially within the normal range, does not have a consistent influence on susceptibility to learned helplessness, in terms of behavioural persistence or attributional patterns.

Sex differences in susceptibility to learned helplessness were determined by comparing the Persistence and IARS scores of the 37 male and 28 female subjects. There was a trend for the girls to have lower Persistence scores than boys ( $t(63)=1.63$ ,  $0.10>P>0.05$ ). A significant sex difference was noted in IARS scores ( $t(63)=3.17$ ,  $P<0.005$ ), with girls more likely to neglect the role of effort in causing their failures. Thus, while female subjects showed the attributional pattern indicative of greater susceptibility to learned helplessness, their behaviour was only marginally less persistent than that of male subjects.

In the second phase of the study, the central hypothesis concerned the effectiveness of vicariously presented reattribution training in improving persistence. Table 2 shows the mean persistence scores of the 32 least persistent subjects both prior to and following the intervention.

TABLE 2  
MEANS AND STANDARD DEVIATIONS OF PERSISTENCE SCORES  
OBTAINED AT PRE- AND POST-TRAINING ASSESSMENT, FOR  
TRAINING AND CONTROL GROUPS (IN SECONDS)

		Training		Control	
		Pre	Post	Pre	Post
Boys	M	48.50	63.50	44.25	48.88
	SD	27.20	66.14	27.60	65.17
Girls	M	40.86	132.71	40.00	16.86
	SD	28.28	36.44	24.05	16.22

The pretraining Persistence scores of these subjects and those of the more persistent subjects who did not take part in the second phase differed significantly. (Males:  $t(35)=7.64$ ,  $P<0.0005$ ; Females:  $t(26)=7.68$ ,  $P<0.005$ ).

Treatment effects were evaluated at post-training using a covariance analysis with pretraining Persistence as the covariate. The analysis showed a significant main effect for Experimental Condition ( $F(1,25)=11.63$ ,  $P<0.01$ ) and also a significant sex by Experimental Condition interaction ( $F(1,25)=7.96$ ,  $P<0.01$ ). No significant main effect was found for sex ( $F(1,25)=1.64$ ,  $P>0.05$ ). Post-hoc analyses using t-tests to compare adjusted group means showed that the difference between treatment conditions was significant for female subjects ( $t(12)=4.56$ ,  $P<0.001$ ) but not for male subjects ( $t(14)=0.43$ ,  $P>0.05$ ). The vicarious reattribution training was therefore effective in improving Persistence in females only.

## DISCUSSION

The major tenet of the attributional model of achievement motivation is that causal ascriptions influence and perhaps even determine subsequent achievement behaviours. The correlation between level of persistence and responses to the IAR subscale tends to support this. A high degree of persistence was associated with attributions for failure to lack of effort. In addition to the confirmation of past research (e.g., Dweck and Reppucci, 1973; Andrews and Debus, 1978; Diener and Dweck, 1978)

this finding adds strength to the rationale of improving persistence through a re-attribution approach. That observational learning is a successful means of enhancing persistence received only partial support in this study. Observation of a model who was rewarded for attributing failure to lack of effort was paralleled by a significant increase in persistence in helpless female subjects, but failed to produce improvements in helpless male subjects.

The differential effectiveness of observational learning is consistent with proposals that males and females differ in the extent to which they draw on environmental factors in performance evaluation. The literature on field dependence, for instance, shows that the perceptions of males are more independent of contextual cues than the perceptions of females (Witkin and Goodenough, 1977). Similarly, Rothbaum's (1981) work on control and responsibility has shown that males are more concerned with what they are able to do irrespective of others, whereas females are more concerned with what other persons can do. To account for these sex differences, it has been proposed (Crandall, 1963; Veroff, 1969; Crandall *et al.*, 1964) that during childhood boys develop internal standards of evaluation which allow them to become relatively independent of feedback from others, while girls remain dependent on external evaluation to assess the quality of their performance.

Assuming that boys and girls do differ in this way, then it is possible to explain the sex difference in treatment effectiveness using an extension of the exchange theory analysis of achievement behaviour (Wyer and Bednar, 1967). According to this analysis the observer of a model receiving rewards for his behaviour compares himself with the model, and acquires expectations for his own reward or success based on the degree of the model's success. When the observer subsequently participates without success, his degree of tolerance for failure (i.e., his willingness to persist) is related to the expectations he has developed. A low success expectancy will be acquired if the observer views a model with a low success rate, such as the 33 per cent rate of correct answers employed in this study. This low success expectancy will result in a high frustration tolerance and high level of persistence when the observer is faced with consecutive failures himself. Given that female observers have a greater need than male observers for external evaluation, their expectancies and subsequent behaviours will be modified to a larger extent by the social comparison process. Thus, girls may demonstrate higher levels of persistence than boys after observing a model with a low rate of success.

An alternative and perhaps more straightforward explanation of the sex difference found can be derived from Beery's (1975) self-worth theory. Self-worth theory asserts that achievement behaviour is largely determined by student attempts to maintain a self-concept of high ability. From this perspective, a combination of high effort expenditure and failure is potentially threatening to the student since it increases suspicions of low ability. Just such a combination was presented to subjects in post-training assessment; they were asked to tackle unsolvable problems after being trained to associate effort with achievement and lack of effort with failure. Research into self-worth motivation suggests that males are more accomplished at self-aggrandisement and more concerned with maintaining an appearance of competence than females (Covington and Omelich, 1979; Covington *et al.*, 1980). This greater desire for the protection of self-worth may explain why the boys were less willing to expend effort at post-test than the girls, thus achieving lower Persistence scores.

If boys are prevented from expending effort when risking failure because of self-worth motivation, the efficacy of effort attribution training with helpless boys is likely to be severely restricted. However, establishing the efficacy of vicariously presented reattribution training still represents an important contribution to the treatment of female helplessness. The advantages of vicarious procedures lie in their cost-

effectiveness: group rather than individual training is possible, and behaviour change usually occurs after relatively short periods of observational learning. In this study, only two sessions of approximately 8 minutes' length produced improvements in persistence. The procedure therefore becomes feasible as a remedial device within the classroom, for female students. It is essential that future studies investigate the generalisability and durability of the persistence improvement, and its effects on academic performance.

One final issue is important in considering the behaviour and cognitions of the least persistent subjects. The possibility exists that some children may have opted out, or become less persistent, when presented with unsolvable problems because they realised they were being duped by the experimenter. If this were the case, then the experimental conditions would have little validity in reflecting real life helplessness situations, in which solutions are possible. In the present sample, none of the subjects indicated they felt they were being misled by the experimenter when they were presented with consecutive red lights in the Persistence tasks. This implies that they had faith in the failure feedback, but does not reflect on their faith in the problems themselves. Some subjects may have had suspicions about their unsolvable nature. The experimental design does not resolve this issue.

In view of the prevalence of helplessness in retarded children (Macmillan and Keogh, 1970; Weisz, 1979), the finding that low-normal intelligence does not predispose the individual to helplessness was surprising. Presumably, the performance history of the low-normal IQ subjects in this study was not dominated by failure to the extent that they learned to view themselves as incapable of achieving success. An issue yet to be investigated is the relationship between superior intelligence and persistence. It may be that particularly bright children are as vulnerable to helplessness as retardates since their performance histories would involve little contact with failure, and therefore few opportunities to develop strategies to cope with failure. Experimentally, the 'success only' reinforcement schedule has been ineffective or less effective than partial reinforcement in enhancing persistence (Nation *et al.*, 1979).

The finding most discrepant with previous research was the similarity of male and female persistence levels. There has been general agreement in the literature that girls are less persistent and more helpless than boys in the 10 to 12 year age group (e.g., Crandall, 1969; Dweck and Reppucci, 1973). The present results indicated only a marginal trend for females to be less persistent, despite the fact that they displayed the attributional pattern associated with helplessness to a greater extent. The role of teacher behaviour in this context is worthy of some scrutiny. Both Crandall (1978) and Dweck *et al.* (1978) argue that sex differences in persistence and attributions are derived largely from the type of feedback given by primary school teachers. Classroom observations led them to conclude that since boys receive a greater proportion and a more indiscriminant application of negative feedback they are discouraged from viewing failure as indicative of low ability. However, such differential reinforcement contingencies have not been found to operate in all classrooms (Heller and Parsons, 1981; Meece *et al.*, 1982) and it appears that they are more likely to operate in the classrooms of female teachers (Sikes, 1971). Furthermore, Dweck and Bush (1976) reported that failure feedback from a male adult agent led to less helplessness than similar feedback from a female adult.

In this study, male teachers had either total or 50 per cent responsibility for the classes from which the subjects were drawn. It is possible therefore that the contingencies assumed to promote sex differences in helplessness were not in existence, or were diminished in their effectiveness. Since female teachers predominate in primary schools, and since generalised attributions for failure are presumed to mediate sex

differences in long-term academic achievement, the issue of differential feedback styles clearly warrants further investigation.

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## LEARNED HELPLESSNESS, SELF-WORTH MOTIVATION AND ATTRIBUTION RETRAINING FOR PRIMARY SCHOOL CHILDREN

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**SUMMARY.** This study examined characteristics of 29 pupils (selected from an initial sample of 69 primary school children) whose performance on an arithmetic task deteriorated after failure. On the basis of their responses to a "mitigating circumstance" which could explain failure without implicating low ability as the cause (a description of the task as "very difficult"), subjects were classified as either learned helpless or motivated to protect self-worth. Both of these groups had lower self-concepts than the rest of the initial sample. Attribution retraining resulted in increased effort attributions and decreased inability attributions in the "learned helpless" group, and inoculated these subjects to the experience of failure. In the "self-worth group" there was an increase in effort attributions but no change in ability ratings or performance after failure, following training.

### INTRODUCTION

PAST research has established that repeated failure can disrupt academic performance, resulting in decreased persistence and achievement levels (e.g., Dweck and Reppucci, 1973; Dweck and Bush, 1976; Andrews and Debus, 1978; Diener and Dweck, 1980). Two possible explanations for this effect are found in the reformulated learned helplessness model (Abramson *et al.*, 1978) and the self-worth theory of achievement motivation (Beery, 1975).

According to the former, a state of learned helplessness is reached when an individual perceives that he lacks control in obtaining a desired outcome. The type of explanation (attribution) the individual makes for his lack of control determines the features of his helplessness. For example, an internal, stable and global attribution will result in depressed affect, diminished self-esteem, low expectancy for future success and deteriorated performance. Thus, in an academic context, a student who has failed repeatedly at a particular task, and who construes the failures as a consequence of his lack of ability, will experience negative affect and a lowering of his self-esteem, and he will not expect to perform well on a similar task in the future. In particular, he will perform more poorly after failure than before, on tasks of equal difficulty (Dweck and Reppucci, 1973; Diener and Dweck, 1978).

Children with poor academic self-concept appear to be particularly susceptible to learned helplessness (Butkowsky and Willows, 1980). It is possible that a self-reinforcing cycle exists with a low self-concept predisposing attributions to lack of ability which then mediate reduced persistence and attainment levels. These in turn serve to maintain the self-concept at a low level. Females are more likely than males to exhibit learned helplessness (e.g., Dweck and Gilliard, 1975; Le Unes *et al.*, 1980; Wilson *et al.*, 1980).

In essence, the learned helplessness model implies that some students may "give up trying" because they do not see themselves as capable of success. Whether or not effort is applied, the outcome will be the same: failure. Logically, there is little to be gained by trying, and nothing to be lost by not trying.

In contrast, the self-worth theory states that, in some circumstances, students stand to gain a great deal by not trying. The self-worth theory is based on the notion that much of a student's behaviour is designed to maintain a self-concept of high ability. To this end, it is important to avoid failure whenever possible since failure carries with it implications of low ability. On the occasions when failure is unavoidable, low ability inferences can be deflected by ascribing it to stable, external factors (such as task difficulty) or to unstable elements (such as bad luck and insufficient effort). From this perspective, it is clear that the application of effort under conditions of possible failure can be risky: if a student tries hard but fails, then suspicions of low ability are increased. A reduction in, or withdrawal of, effort after a failure experience can therefore be used by the student as a strategy to prevent further damage to his sense of self-worth. Consequences of the withdrawal of effort are decreased persistence and achievement levels.

It has been noted that males are more inclined to defend their self-worth than females (Snyder *et al.*, 1978; Covington and Omelich, 1979). They also prefer to obtain successes through high ability, rather than the application of effort (Covington and Omelich, 1981). The relationship between self-concept and self-worth motivation has yet to be precisely determined. Evidence that males have higher self-concepts than females (Ickes and Layden, 1978), and that they are also more likely to defend their self-worth, suggests a tendency for high self-concept individuals to prefer self-serving attributions, and this has been reported in at least one study (Schwarzer and Jerusalem, 1982). However, students low in academic self-concept have also been reported as high in self-worth motivation (Covington and Omelich, 1979).

These two models represent different explanations for persistence and attainment decrements after failure. Two attempts have been made to determine which model provides the "better" explanation. Frankel and Snyder (1978) and Snyder *et al.* (1981) found that college students produced improved performances after failure under conditions (either high task difficulty or distracting background music) which could provide an explanation for failure without implying low ability. Learned helplessness predicts that such conditions would increase the subjects' perception of lack of control and therefore lead to worsened performances. This did not occur, and the authors interpreted the results as support for the self-worth (or egotism) model. However, the issue as to which is the most appropriate explanation is far from settled. A major difficulty in making comparisons has been the different subject populations used: primary school children have been the focus of learned helplessness research, and college students the target of self-worth investigations.

Numerous studies have established attribution retraining as an effective means of overcoming or inoculating against helplessness (e.g., Dweck, 1975; Andrews and Debus, 1978; Fowler and Peterson, 1981; Medway and Venino, 1982). Attribution retraining is designed to teach students to construe lack of effort as the cause of failures, and to recognise that success is more likely with effort. Craske (1985) used vicarious attribution retraining with "helpless" subjects who were selected from a larger population on the basis of deteriorated performances after failure. It proved to be an effective intervention for female subjects, but not for males. One possible explanation for this result assumes that some of the subjects, particularly males, were not "helpless" but had reduced effort after failure in an attempt to protect self-worth. Therefore, they did not respond to a technique designed to overcome "helplessness".

It seems logical to propose that both self-worth protection and learned helplessness exist amongst primary schoolchildren. It is proposed that some children decrease persistence after failure because they wish to avoid the appearance of



inability, and others because they believe they are unable to control outcomes and trying is therefore irrelevant. Distinguishing between these two populations is important, since attempts to overcome low persistence will have varying effects depending on the reason for its existence. While it may be useful to train "helpless" students to attribute failure to low effort, to do so with self-worth motivated students may decrease persistence further. (If failure still occurs, even with the application of more effort, inability is strongly implicated.)

The main purpose of this study is to distinguish between those children whose deteriorated performance after failure is a consequence of learned helplessness, and those whose performance is motivated by self-worth considerations. It is predicted that these two groups will differ in their attributions for failure, and in their response to an attribution retraining procedure. It is also predicted that there will be more males in the latter category and more females in the former. In addition, the relationship of self-concept to learned helplessness and self-worth motivation will be investigated.

#### METHOD

##### *Sample*

Thirty-five male and 34 female pupils from a state primary school near Hobart constituted the initial sample for the study. They were drawn from Grade 4, 5 and 6 classrooms. The mean age was 10 years 7 months for both males and females. Grades 4 and 6 were taught by females, and Grade 5 by a male teacher. The catchment area of the school is mixed in terms of socio-economic status but is predominantly lower middle class.

##### *Pretraining measures*

Pretraining assessment consisted of measures of self-concept, performance after failure, attributions for failure, and response to a "mitigating circumstance" which could account for failure without implicating low ability.

*Self-concept.* This was assessed using the School Form of the Coopersmith Self-Esteem Inventory (Coopersmith, 1981). The SEI is a 58-item questionnaire designed to measure evaluative attitudes toward the self in social, academic, family and personal areas of experience. A Lie Scale is also included. Kimball (1973) obtained reliability coefficients ranging from 0.87 to 0.92 for Grades 4 to 8; Spatz and Johnston (1973) obtained a coefficient of 0.81 for Grade 5. Adequate concurrent and construct validity have been reported by Kokenes (1974, 1978), and Simon and Simon (1975).

Pupils completed the inventory in classroom groups. None recorded extreme Lie scores.

*Performance after failure and response to a "mitigating circumstance".* These were assessed using four sets of sums: Sets A-D. The sets consisted of 10 sums for Grade 4 pupils, 15 sums for Grade 5 pupils, and 18 sums for Grade 6 pupils. Sets A, C and D were constructed so as to be within the capability of each child, according to his/her teacher's report, and consisted of sums requiring the operation of the four basic processes: addition, subtraction, multiplication and division. The sums were classified according to a number of categories (with and without regrouping, short and long division, short and long multiplication, inclusion of a zero in the figure, decimal figures). These categories were represented consistently across Sets A, C and D, although the actual numbers were altered. In this way the sets were matched for expected difficulty. Children were told that they were required only to do as many sums as they wished.

An addition was made to the instructions for Set D: "The sums in Set D are

much harder than the others you have just done. I do not expect you to get many right. Just do as many sums as you like. You can stop when you want to." This instruction was included to provide an explanation for failure which does not implicate low ability. Set B was designed to provide a failure experience. It consisted of sums beyond the capability of the pupils. They were required to complete all of the sums on this set, and the salience of failure was enhanced by the experimenter marking the sums in the child's presence. At least two-thirds of the sums were marked as incorrect. Following the marking of Set B, pupils were required to indicate whether they had made some mistakes or achieved correct answers on all the sums, and to rate how well they felt they had done on Set B (very poorly, just OK, or very well). These questions were included to provide some check on the success of the experimental manipulation, i.e., that pupils did perceive Set B to be a "failure experience". Answers to the questions indicate that this was the case.

Attainment on Sets A, C and D was measured by a composite score taking into account both the number of sums attempted and the number correct in each set.

The index of performance after failure was calculated by subtracting the attainment score on Set C from the attainment score on Set A.

*Attributions for failure.* Scales to measure attributions for failure were included following Set B. Attributions used were the four commonly employed by students to explain their performances, and described by Weiner (1979): luck, task difficulty, effort and ability. Pupils were asked to indicate on a 7-point scale (ranging from 1: not at all important, to 7: very, very important) how important bad luck, the difficulty of the sums, lack of trying, and lack of ability were as causes of their mistakes. The Grade 4 children were given prior instructions in the use of such scales by the experimenter, and no difficulties were apparent.

Following the procedures used by Arkin and Maruyama (1979), and Gollwitzer *et al.* (1982), the four attributional measures were combined to create two distinct dimensions: internal-external and stable-unstable. These dimensions are delineated in Weiner's taxonomy of causes (1972, 1974). An index of internality was obtained by subtracting luck plus difficulty from the sum of effort plus ability scores, and of stability by subtracting luck plus effort from the sum of ability plus difficulty scores. The possible range for these composite scores is -12 to +12, with positive scores indicating internal and stable attributions and negative scores indicating external and unstable attributions.

##### *Selection of Learned Helpless (LH) and Self-Worth (SW) groups*

Pupils whose performance deteriorated after failure (i.e., whose score on Set C was lower than the score on Set A) were selected for training in the second phase of the study. Twenty-nine (42 per cent of the initial sample) fell into this category.

Division into LH and SW groups was based on their responses to the "mitigating circumstance". Those who did better in Set D than A were classified as subjects motivated by self-worth considerations, i.e., their performance improved when the necessity for protecting self-worth was removed. Eleven pupils (five girls and six boys) fell into this category. Those who did better in Set A than D were considered to be displaying learned helplessness: their performance had already been disrupted by failure and the description of high task difficulty produced a further deterioration. Eighteen pupils (10 girls and 8 boys) were classified in the LH group.

##### *Training*

Training was based on the reattribution approach; it was designed to counteract the disruptive effect of failure by encouraging pupils to view failures as the result of lack of effort, and to view subsequent successes as more likely with increased effort.

Pupils worked together in groups of five or six same-sex children, whose capability at sums was roughly equivalent. Thirty sums were displayed on a blackboard. The sums were arranged such that one in three was extremely difficult (and failure was anticipated on these) and no more than two "failure" sums occurred consecutively. The remaining sums were within the pupils' capabilities, and success was expected.

Pupils were told that they had been selected to play a maths game, with the following procedure. Each person in rotation had the opportunity to throw two dice. Two sixes earned a chance to work some sums on the blackboard, as many as could be completed until the next double six was thrown by another member of the group. When this occurred, the next person came to the board and began to work a new sum. Each time a sum was completed the game playing was stopped, and the correctness or otherwise of the solution was signalled by a green light for a right answer, and a red light for a wrong answer. At this point, the pupil who had completed the sum was asked to make an attribution for the outcome by selecting from the following choices which were displayed on a large chart:

I got the sum right because: I had good luck  
It was easy  
I tried hard  
I am clever

I got the sum wrong because: I had bad luck  
It was too hard  
I didn't try hard enough  
I'm not clever enough

Spontaneously made effort attributions were verbally reinforced by the experimenter (e.g., "Yes, that's right. You got the sum right because you did try hard"). Minimal cueing was allowable when spontaneous effort attributions were not forthcoming (e.g., "I think you got the sum wrong because you weren't trying hard enough"). In practice such cues were rarely needed, other than in the first few minutes of the game which lasted between 30 to 40 minutes in all.

The fact that children were required to make attributions publicly may have influenced their attributions, though any influence is likely to have been in the desired direction (House, 1980).

The procedure aimed to maximise cost-effectiveness (by working with groups rather than individuals) and the benefits of participant modelling. Previous research (e.g., Brown and Inouye, 1978; De Vellis *et al.*, 1978; Breen *et al.*, 1979; Zimmerman and Blotner, 1979; Zimmerman and Ringle, 1981; Craske, 1985) has indicated the usefulness of vicarious learning in reducing the disruptive effect of failure. Although it is possible that presenting training in the form of a dice game may have reduced its significance to some children, it was decided to do so in order to reduce the possible inhibiting effect of self-consciousness. Brockner (1979) suggests that the performance of low self-esteem individuals can be improved by reducing anxiety before making them self-aware.

#### Post-training measures

The second phase of the study was designed to measure the effectiveness of training on the disruptive effect of failure, and on attributions for failure. Post-training assessment consisted of administration of Sets E, F and G. These were matched for expected difficulty with Sets A, B and C and followed the same procedure and instructions. As before an index of performance after failure was obtained by subtracting the attainment score on Set G from the attainment score on

Set E. Attributions for failure were assessed as before, following completion of Set F (the failure experience). These measures were taken on the same day or the day following training.

All pupils were debriefed after post-training measures were completed, and emphasis was placed on the fact that failures in Set B were contrived by the experimenter, and therefore did not reflect on pupils' ability levels. Many pupils expressed surprise that the outcome had been manipulated in this way.

## RESULTS

The main purpose of this study was to examine the self-concept, attributions and response to attribution retraining of those children whose performance deteriorated after failure. Analyses were also conducted on the scores of the initial sample of 69 children. Although the dependent variable measures probably do not constitute interval scales, the use of parametric statistical tests is still appropriate provided the score distributions do not markedly depart from the normal form (McNemar, 1969). Accordingly parametric procedures were used in analysing the results.

Table 1 shows the mean scores obtained from the initial sample at pre-testing.

#### Initial sample

No significant sex differences were noted: boys and girls did not differ in terms of self-concept, the disruptive effect of failure, attributions for failure, or response to a mitigating circumstance.

Relationships between self-concept and A-C (response to failure), and self-concept and A-D (response to a mitigating circumstance) were examined. Because Sets A, C and D varied in length for Grades 4, 5 and 6, a pooled within-groups correlation (Keppel, 1982) was obtained, rather than a direct correlation. The

TABLE 1  
MEANS AND STANDARD DEVIATIONS OF SCORES ON PRETRAINING MEASURES FOR INITIAL SAMPLE

	Boys (N = 35)		Girls (N = 34)	
	M	SD	M	SD
Self Concept	33.11	7.03	31.29	7.81
Performance after Failure <sup>a</sup>	0.80	3.72	0.41	3.46
Attributions for Failure <sup>b</sup>				
Luck	3.91	1.87	4.82	1.99
Difficulty	3.86	1.77	4.15	1.67
Effort	4.26	1.90	4.77	1.72
Ability	4.23	1.75	4.79	1.87
Composite Scores <sup>c</sup>				
Internality	0.71	2.07	0.59	3.06
Stability	-0.03	4.07	-0.56	3.68
Response to a Mitigating Circumstance <sup>d</sup>	0.17	4.47	0.91	4.36

a Difference between attainment score on Set A and attainment score on Set C.

b Range = 1 (not important at all) to 7 (very, very important).

c Range = -12 (external, unstable) to +12 (internal, stable).

d Difference between attainment score on Set A and attainment score on Set D.

pooled correlation between self-concept and A-C was significant ( $r = 0.30$ ,  $P < 0.05$ ) i.e., failure was most disruptive to the performance of low self-concept children. Self-concept was not related to response to a mitigating circumstance ( $r = 0.09$ , NS).

Contrary to expectation, no significant correlations were found between self-concept and attributions for failure.

#### LH and SW groups

The 29 pupils whose performance deteriorated after failure were selected for training. Means obtained at pre-testing appear in Table 2.

These pupils had significantly lower self-concepts ( $t(67) = 2.96$ ,  $P < 0.01$ ), and, inconsistently, rated both stable factors ( $t(67) = -3.35$ ,  $P < 0.01$ ) and lack of effort ( $t(67) = 3.69$ ,  $P < 0.001$ ) as more important causes of their failures than the remainder of the sample. As a group they responded to being informed of increased task difficulty more poorly than other subjects (i.e., their A-D scores were larger) ( $t(67) = -3.15$ ,  $P < 0.05$ ).

TABLE 2  
MEANS AND STANDARD DEVIATIONS OF SCORES ON PRETRAINING MEASURES FOR LH AND SW SUBJECTS

		LH		SW	
		Boys (N=8)	Girls (N=10)	Boys (N=6)	Girls (N=5)
Self-Concept	M	32.13	28.20	29.17	27.00
	SD	4.83	7.35	4.41	3.35
Performance after Failure <sup>a</sup>	M	4.63	4.00	4.00	2.20
	SD	2.29	2.72	5.65	1.47
Attributions for Failure <sup>b</sup>					
	Luck				
	M	3.00	4.70	3.67	5.40
	SD	2.18	1.36	1.49	1.63
Difficulty	M	4.25	4.00	4.50	3.80
	SD	1.71	1.43	2.06	0.40
Effort	M	3.25	4.50	3.67	4.80
	SD	1.71	1.61	1.60	1.60
Ability	M	6.00	6.10	4.17	4.40
	SD	0.87	1.48	1.77	1.02
Composite Scores <sup>c</sup>					
	Internality				
	M	2.00	1.90	0.33	0.00
	SD	1.66	2.47	2.43	2.10
Stability	M	4.00	1.10	1.33	-2.00
	SD	4.09	3.52	4.11	2.28
Response to a Mitigating Circumstance <sup>d</sup>					
	M	4.75	5.40	-2.83	-1.20
	SD	4.55	3.58	2.85	0.40

a Difference between attainment score on Set A and attainment score on Set C.

b Range = 1 (not important at all) to 7 (very, very important).

c Range = -12 (external, unstable) to +12 (internal, stable).

d Difference between attainment score on Set A and attainment score on Set D.

TABLE 3  
MEANS AND STANDARD DEVIATIONS OF SCORES ON POST-TRAINING MEASURES

		LH		SW	
		Boys (N=8)	Girls (N=10)	Boys (N=6)	Girls (N=5)
Performance after Failure <sup>a</sup>	M	-1.50	-1.70	2.67	3.20
	SD	1.00	3.41	7.43	3.97
Attributions for Failure <sup>b</sup>					
	Luck				
	M	3.50	4.90	5.67	4.20
	SD	2.35	1.81	0.94	1.94
Difficulty	M	4.25	4.50	5.17	4.40
	SD	2.05	1.50	1.07	1.62
Effort	M	5.88	6.00	6.17	5.60
	SD	1.97	1.18	0.69	1.74
Ability	M	3.88	5.30	4.50	5.80
	SD	1.90	1.27	1.50	1.17
Composite Scores <sup>c</sup>					
	Internality				
	M	2.00	2.90	-0.17	2.80
	SD	2.40	3.73	1.34	2.04
Stability	M	-1.25	-1.10	-2.17	0.40
	SD	3.03	1.22	2.12	2.33

a Difference between attainment score on Set E and attainment score on Set G.

b Range = 1 (not important at all) to 7 (very, very important).

c Range = -12 (external, unstable) to +12 (internal, stable).

Of most interest is the differentiation between LH and SW groups. By definition, the LH group performed much more poorly than the SW group when told of increased difficulty; it also tended to rate lack of ability more highly ( $F(1,25) = 9.98$ ,  $P < 0.01$ ). This was reflected in higher internality scores ( $F(1,25) = 5.27$ ,  $P < 0.05$ ). LH and SW groups did not differ from each other in self-concept ( $F(1,25) = 0.78$ ,  $P > 0.05$ ) or in the extent to which failure disrupted performance, ( $F(1,25) = 1.11$ ,  $P > 0.05$ ).

#### Effect of training

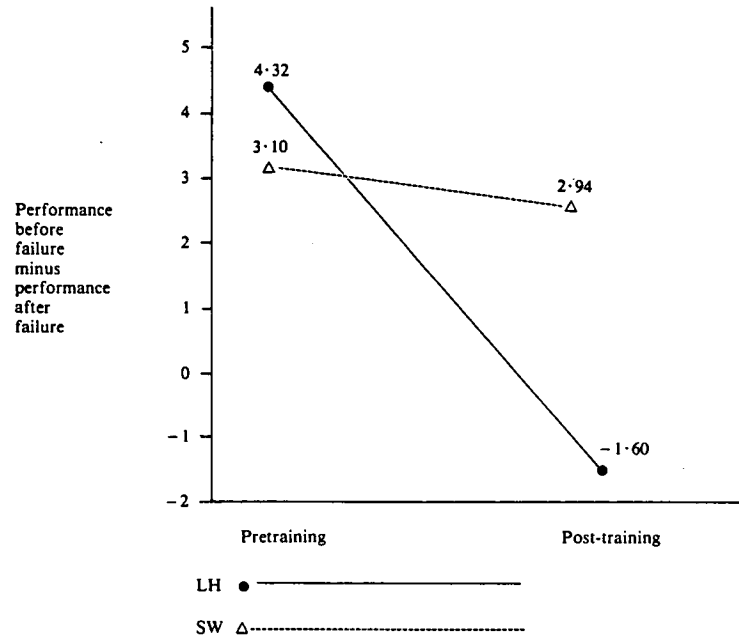
In the second phase of the study, the central hypothesis concerned the effectiveness of reattribution training in reducing the disruptive effect of failure. It was predicted that only the LH group would respond to training. Interest also lay in the effect of training on attributions for failure. Table 3 shows the mean scores obtained for post-training variables.

The effect of training on decrement in performance following failure (E-G scores) was examined using analysis of covariance, to make allowance for differences in set lengths as reflected in pre-training (A-C) scores. The assumption of homogeneity of regression (Keppel, 1982) was tested. No evidence of non-homogeneity was found ( $F(3,21) = 0.26$ , NS).

The covariance analysis showed a significant main effect for group ( $F(1,24) = 6.38$ ,  $P < 0.05$ ). After training, the effect of failure was significantly less disruptive

for the LH group than it was for the SW group (see Figure 1). Thirteen of the LH group ( $N = 18$ ) actually improved after failure at post-testing, compared to two of the SW group ( $N = 11$ ).

FIGURE 1  
THE EFFECT OF TRAINING ON PERFORMANCE AFTER FAILURE

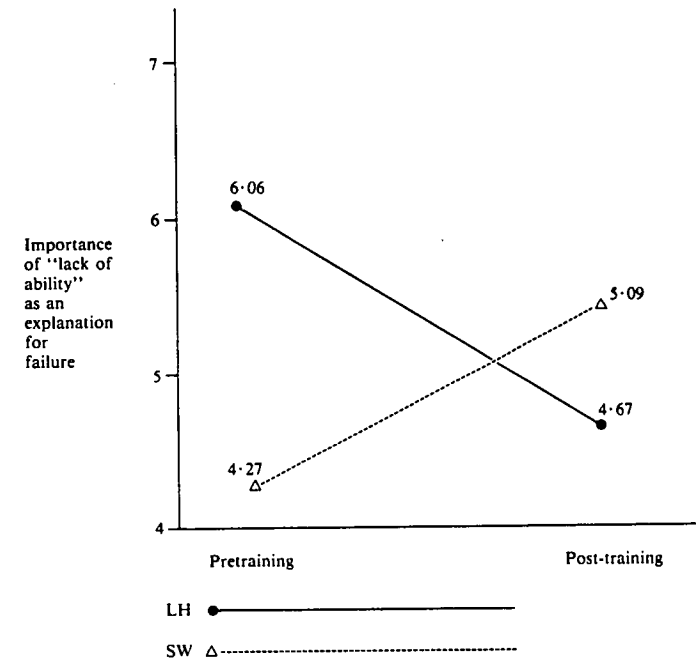


Two factor analyses of variance (Groups  $\times$  Occasions) were conducted to evaluate the effect of training on attributions. Significant main effects for Occasions were noted on the effort ( $F(1,27) = 18.05$ ,  $P < 0.001$ ) and stability ( $F(1,27) = 4.71$ ,  $P < 0.05$ ) factors. After training lack of effort was rated more highly than before, and this change was reflected in lower stability scores.

A significant main effect for groups was found on the internality factor ( $F(1,27) = 5.36$ ,  $P < 0.05$ ). The LH group had consistently higher internality scores than the SW group at both pre- and post-testing.

Of most importance is the Groups  $\times$  Occasions interaction effect, which determines whether attributional differences between LH and SW groups altered as a result of training. This was found to be significant for the ability factor ( $F(1,27) = 9.31$ ,  $P < 0.01$ ). Training influenced the ability ratings of the two groups differently. At post-testing the LH group placed less importance on lack of ability as a cause of failure, while the SW group tended to rate lack of ability slightly more highly (see Figure 2).

FIGURE 2  
THE EFFECT OF TRAINING ON ABILITY ATTRIBUTIONS



## DISCUSSION

This study was designed to examine differences between those pupils whose performance deteriorated after failure because they felt academically helpless, and those who were protecting a sense of self-worth. Of most significance was the differing response of these two groups to the attribution retraining procedure. The LH group appeared inoculated to the experience of failure (or even motivated by it), while the SW group did not respond to training. This finding is in line with other research (e.g., Dweck, 1975; Andrews and Debus, 1978; Fowler and Peterson, 1981; Medway and Venino, 1982; Craske, 1985), which has also found attribution retraining to be an effective means of improving performance after failure, for pupils in the LH category.

The intervention also produced attributional change. After training, both groups increased the emphasis placed on lack of effort as a cause of failure. This was expected since the intervention encouraged subjects to explain their performances in terms of the application of effort. Similar results have been found by Dweck (1975), Andrews and Debus (1978), Gattling-Stiller *et al.* (1979) and Fowler and Peterson (1981).

Attribution retraining is based on the rationale that increased emphasis on effort mediates improved performances. It is assumed that as a child comes to understand that his mistakes occur because he has not applied enough effort, and that he can improve his performance by trying harder, his perceptions of inability will decrease, and there will be a corresponding increase in feelings of self-efficacy and expectations for future success. Such expectations are crucial determinants of subsequent, improved performances (Bandura, 1981; Schunk, 1983, 1984).

This process appears to be operating in the LH group and is reflected in their increased effort ratings, decreased ability ratings and better performances in the face of failure, after training. Although no post-training measure of self-concept was taken, an increase in self-concept would be predicted. Such an increase is also suggested by the correlation found in the initial sample between self-concept and A-C scores, i.e., children with higher self-concepts found failure to be less disruptive to their performance than their peers with lower self-concepts.

Pupils in the SW group did not show the same responses to training. They learnt to emphasise effort, but did not make the corresponding changes in ability ratings or performance. The reason for this is not clear. However, the level of pretraining ability ratings may be important. Prior to the intervention, the SW group placed significantly less importance on lack of ability as a cause of failure than did the LH.

Alternatively, it is possible that the improved performance exhibited by the LH group was unrelated to attributional change, but occurred because the experimenters' encouragement of attributions to lack of effort was perceived as an instruction to try harder. Hence, the LH group's increased persistence following intervention could simply reflect a compliance with the instruction. If this is the case, then the SW group's fear of "trying and failing" may have prevented them from complying in the same way that the LH group did. Covington and Omelich (1979) address this issue in describing effort as "the double edged sword in school achievement". When teachers give instructions to try hard and when they reward effort they may be presenting some students with a difficult choice: between compliance (and praise), on the one hand, and self-worth protection, on the other.

It is clear that further work is required to clarify the precipitants of behaviour change, its durability and generalisability, and the exact links between behaviour and attributions. Weiner's theory of achievement motivation does not postulate a direct link between causal attributions and behaviours, but includes additional intervening variables such as affects and expectancies. These intervening variables were not assessed in this study and have not received the same amount of research attention as attribution.

In addition, differences between LH and SW groups need to be examined further. From this study, both groups appear to have a number of features in common — they are not differentiated by sex or the extent to which they find failure to be disruptive. Both groups have lower self-concepts than their peers, but not from one another. Yet they had markedly different responses to the intervention. Attribution retraining (for whatever reasons) was effective in improving the performance of LH children, but appropriate interventions for SW children have yet to be investigated. Beery (1975) suggests that any treatment for the latter group must be based on the development of a sense of self-worth which is not contingent on ability.

The lack of sex differences on any variables is worthy of a final comment. A large amount of research has shown that girls are more likely to exhibit LH (e.g., Crandall, 1969; Dweck and Reppucci, 1973; Dweck and Gilliard, 1975; Gody, 1978;

Wilson *et al.*, 1980; Le Unes *et al.*, 1980) and to attribute failure to a lack of ability (e.g., Dweck and Reppucci, 1973; Nicholls, 1975, 1979; Dweck and Bush, 1976; Dweck *et al.*, 1978; Craske, 1985), while boys are more likely to be motivated by self-worth considerations (Covington and Omelich, 1979; Snyder *et al.*, 1978). As Craske (1985) notes, the influence of a male teacher may be significant. It has been argued that male teachers are less likely to give the sort of feedback which encourages students to view failure as indicative of low ability, and therefore to become susceptible to LH. Some of the subjects in the present study were taught by a male. The role of teacher behaviour in determining self-worth motivation has yet to be examined.

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## APPENDIX 2

### QUESTIONNAIRES

Appendix 2.1: Intellectual Achievement Responsibility  
Sub-scale.

Name \_\_\_\_\_

This is not a test. There are no right or wrong answers. Each question has two endings. Choose the ending (a) or (b) which makes more sense to you. Please place a tick in the box next to the ending you choose.

Ask if you do not understand any part.

Thank you.

1. When you have trouble understanding something in school is it usually  
☐ (a) because the teacher didn't explain it clearly, or  
☐ (b) because you didn't listen carefully?
2. When you read a story and can't remember much of it, is it usually  
☐ (a) because the story wasn't well written, or  
☐ (b) because you weren't interested in the story?
3. Suppose a person doesn't think you are very bright or clever  
☐ (a) can you make him change his mind if you try, or  
☐ (b) are there some people who will think you're not very bright no matter what you do?
4. Suppose you study to become a teacher, scientist, or doctor and you fail. Do you think this would happen  
☐ (a) because you didn't work hard enough, or  
☐ (b) because you needed some help and other people didn't give it to you?



5. When you find it hard to work arithmetic or maths problems at school, is it
- [ ] (a) because you didn't study well enough before you tried them, or
  - [ ] (b) because the teacher gave problems that were too hard?
6. When you forget something you heard in class, is it
- [ ] (a) because the teacher didn't explain it very well, or
  - [ ] (b) because you didn't try very hard to remember?
7. When you don't do well on a test at school, is it
- [ ] (a) because the test was especially hard, or
  - [ ] (b) because you didn't study for it?
8. Suppose you don't do as well as usual in a subject at school. Would this probably happen
- [ ] (a) because you weren't as careful as usual, or
  - [ ] (b) because somebody bothered you and kept you from working?
9. Suppose you're not sure about the answer to a question your teacher asks you and the answer you give turns out to be wrong. Is it likely to happen
- [ ] (a) because she was more particular than usual, or
  - [ ] (b) because you answered too quickly?
10. If a teacher says to you, "Try to do better", would it be
- [ ] (a) because this is something she might say to get pupils to try harder, or
  - [ ] (b) because your work wasn't as good as usual?

Appendix 2.2: General Knowledge Questions  
Pre-test

1. There are ? days in one year.

- (i) 200
- (ii) 365
- (iii) 541
- (iv) 34

2. The month after March is ?.

- (i) May
- (ii) September
- (iii) April
- (iv) December

3. The ? is one of Australia's most famous animals.

- (i) elephant
- (ii) cat
- (iii) tiger
- (iv) kangaroo

4. A young cow is known as a ?

- (i) calf
- (ii) kitten
- (iii) puppy
- (iv) vixen

5.  $9 \times 8 = ?$

- (i) 73
- (ii) 63
- (iii) 72
- (iv) 64

6. The capital of ? is Hobart.

- (i) Launceston
- (ii) Queensland
- (iii) London
- (iv) Tasmania

7. If I had \$1.00 and bought a pencil for 44 cents, how much would I have left?

- (i) 46 cents
- (ii) 56 cents
- (iii) 18 cents
- (iv) 54 cents

8. Hobart lies on the ? River.

- (i) Tamar
- (ii) Derwent
- (iii) Tasman
- (iv) Swan

Post-test

1. The colours in the Australian flag are ?.

- (i) pink and green
- (ii) red, white and blue
- (iii) yellow and black.

2.  $9 \times 6 = ?$

- (i) 54
- (ii) 72
- (iii) 63

3. Tasmania is a state of ?

- (i) England
- (ii) New South Wales
- (iii) Australia
- (iv) Pacific Ocean.

4. 2.45 is the same as ?

- (i)  $\frac{1}{4}$  past 2
- (ii)  $\frac{1}{4}$  to 3
- (iii)  $\frac{1}{2}$  past 5
- (iv) 2 o'clock

5. There are ? months in one year.

- (i) 11
- (ii) 52
- (iii) 7
- (iv) 12

6. Port Arthur is the place where ? were kept.

- (i) convicts
- (ii) elephants
- (iii) boats
- (iv) aborigines

7. Recently, the ? Games were held in Brisbane.

- (i) Olympic
- (ii) Australian
- (iii) Commonwealth

8. A young swan is known as a ?

- (i) chick
- (ii) cygnet
- (iii) duck

Appendix 2.3: Coopersmith Self-Esteem Inventory

Underneath, you will find a list of statements about feelings. If a statement describes how you usually feel, put an X in the column "Like Me". If the statement does not describe how you usually feel, put an X in the column "Unlike Me". There are no right or wrong answers.

Like Me	Unlike Me		
....	....	1.	Things usually don't worry me.
....	....	2.	I find it very hard to talk in front of the class.
....	....	3.	There are lots of things about myself I'd change if I could.
....	....	4.	I can make up my mind without too much trouble.
....	....	5.	I'm a lot of fun to be with.
....	....	6.	I get upset easily at home.
....	....	7.	It takes me a long time to get used to anything new.
....	....	8.	I'm popular with kids my own age.
....	....	9.	My parents usually consider my feelings.
....	....	10.	I give in very easily.
....	....	11.	My parents expect too much of me.
....	....	12.	It's pretty tough to be me.
....	....	13.	Things are all mixed up in my life.
....	....	14.	Kids usually follow my ideas.
....	....	15.	I have a low opinion of myself.
....	....	16.	There are many times when I'd like to leave home.
....	....	17.	I often feel upset in school.
....	....	18.	I'm not as nice looking as most people.
....	....	19.	If I have something to say, I usually say it.
....	....	20.	My parents understand me.
....	....	21.	Most people are better liked than I am.
....	....	22.	I usually feel as if my parents are pushing me.
....	....	23.	I often get discouraged at school.
....	....	24.	I often wish I were someone else.
....	....	25.	I can't be depended on.
....	....	26.	I never worry about anything.
....	....	27.	I'm pretty sure of myself.
....	....	28.	I'm easy to like.
....	....	29.	My parents and I have a lot of fun together.
....	....	30.	I spend a lot of time daydreaming.
....	....	31.	I wish I were younger.
....	....	32.	I always do the right thing.
....	....	33.	I'm proud of my school work.
....	....	34.	Someone always has to tell me what to do.
....	....	35.	I'm often sorry for the things I do.
....	....	36.	I'm never happy.
....	....	37.	I'm doing the best work that I can.
....	....	38.	I can usually take care of myself.
....	....	39.	I'm pretty happy.

Like Me	Unlike Me		
....	....	40,	I would rather play with children younger than I am.
....	....	41,	I like everyone I know.
....	....	42,	I like to be called on in class.
....	....	43,	I understand myself.
....	....	44,	No one pays much attention to me at home.
....	....	45,	I never get scolded.
....	....	46,	I'm not doing as well in school as I'd like to.
....	....	47,	I can make up my mind and stick to it.
....	....	48,	I really don't like being a boy/girl.
....	....	49,	I don't like to be with other people.
....	....	50,	I'm never shy.
....	....	51,	I often feel ashamed of myself.
....	....	52,	Kids pick on me very often.
....	....	53,	I always tell the truth.
....	....	54,	My teachers make me feel I'm not good enough.
....	....	55,	I don't care what happens to me.
....	....	56,	I'm a failure.
....	....	57,	I get upset easily when I'm scolded.
....	....	58,	I always know what to say to people.

Appendix 2.4: Attributional Ratings.

How important were each of these things in causing you to make some mistakes in the last set? Circle the number which matches what you think.

I had bad luck

1	2	3	4	5	6	7
						Very
						very
						important

Not important at all

The sums were too hard

1	2	3	4	5	6	7
						Very
						very
						important

Not important at all

I wasn't clever enough

1	2	3	4	5	6	7
						Very
						very
						important

Not important at all

I didn't try hard enough

1	2	3	4	5	6	7
						Very
						very
						important

Not important at all

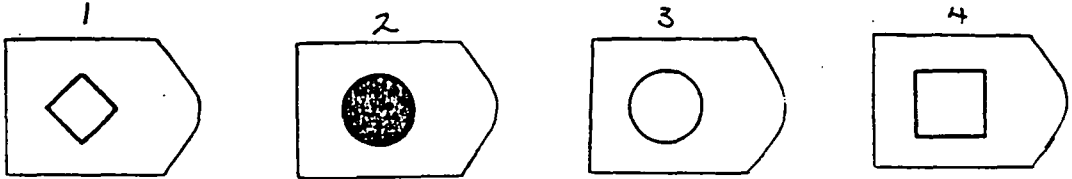
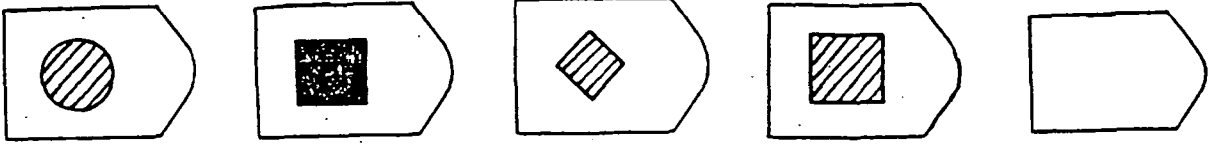
APPENDIX 3

PUZZLE COMPLETION PROBLEMS

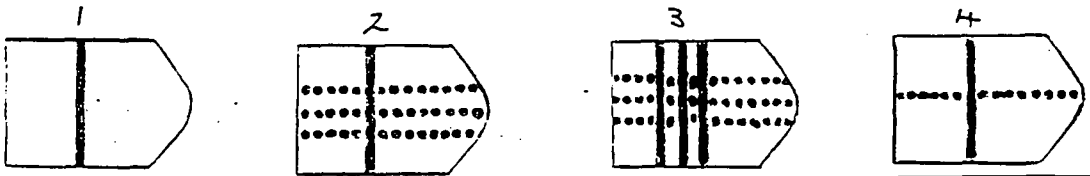
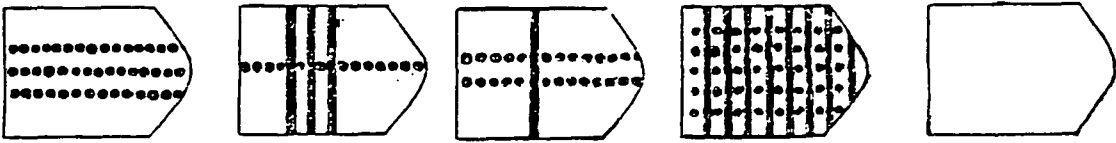
EXPERIMENT 1



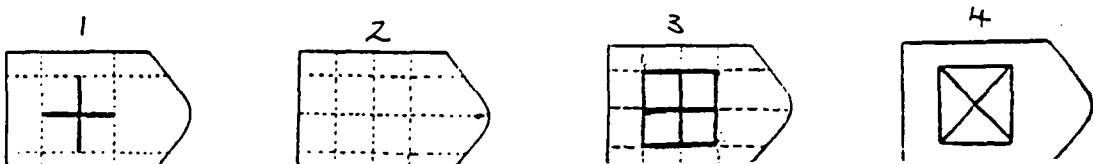
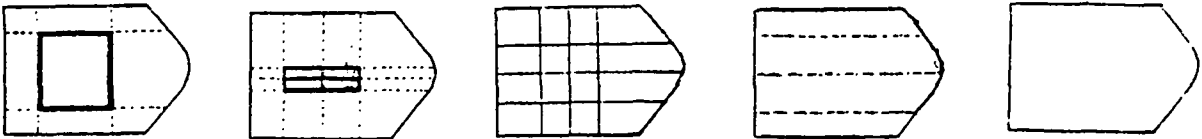
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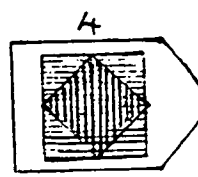
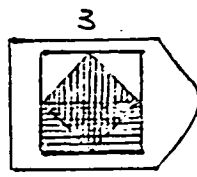
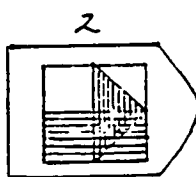
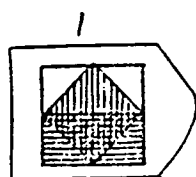
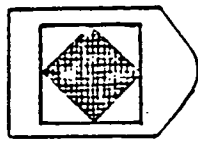
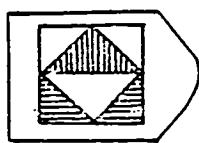
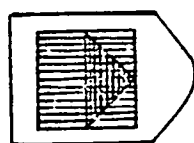
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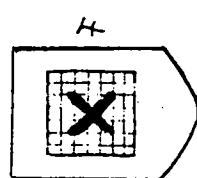
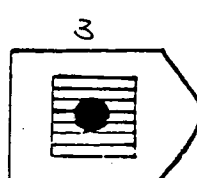
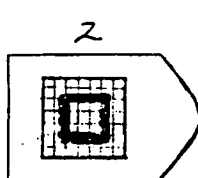
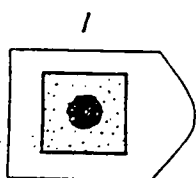
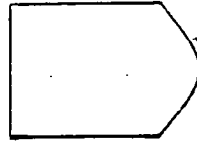
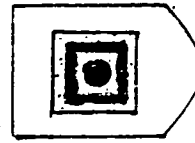
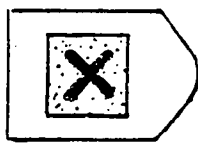
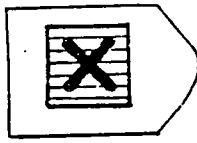
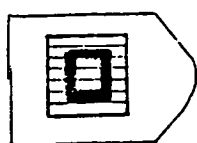
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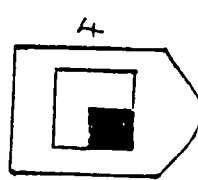
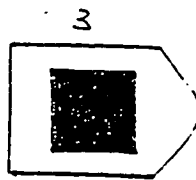
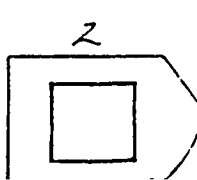
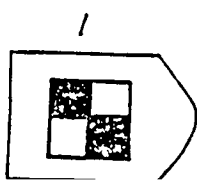
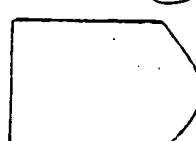
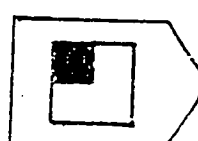
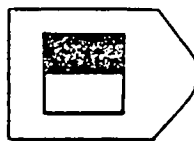
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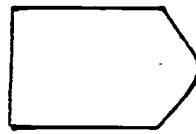
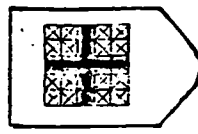
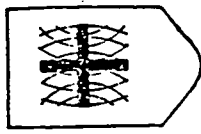
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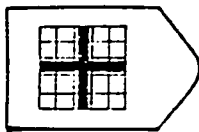
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⑦



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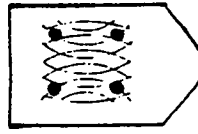
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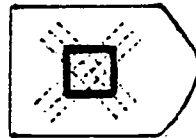
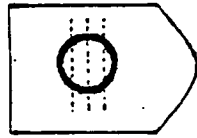
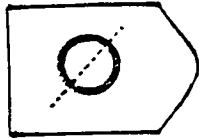
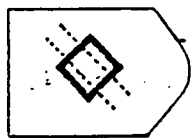
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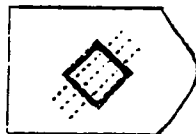
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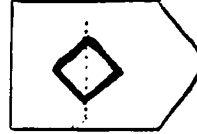
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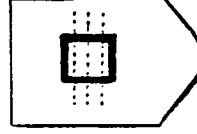
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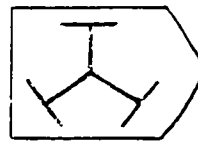
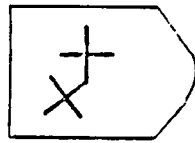
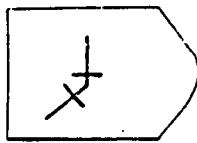
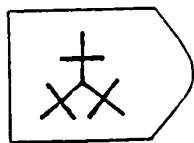
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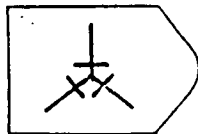
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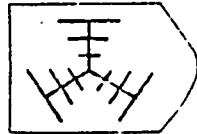
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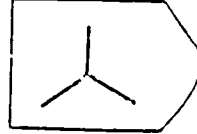
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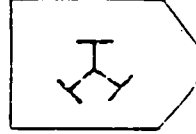
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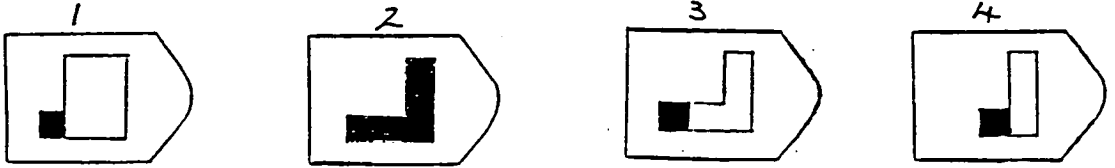
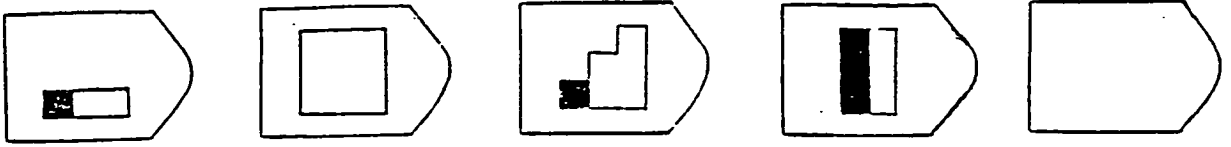
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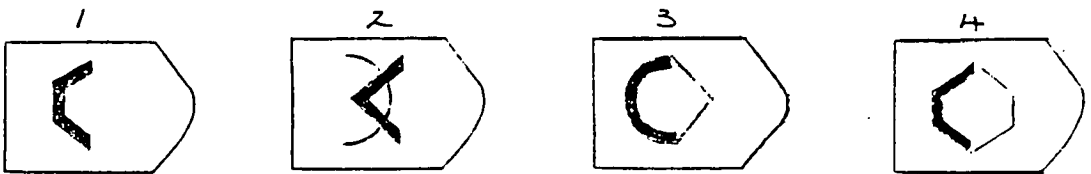
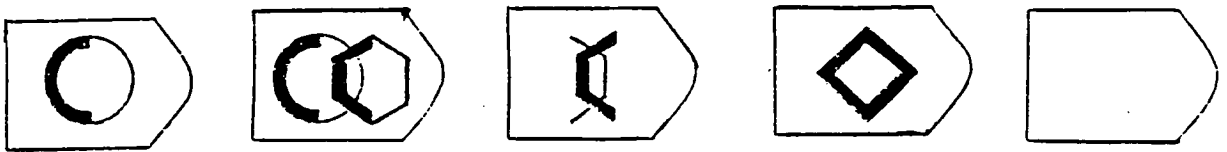
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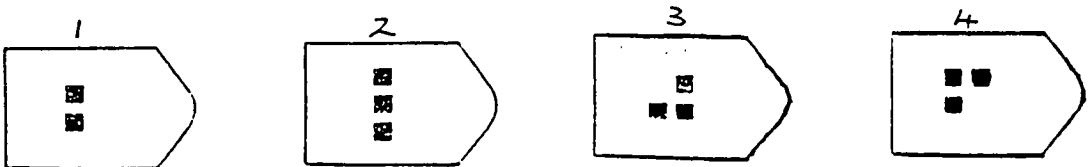
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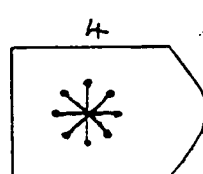
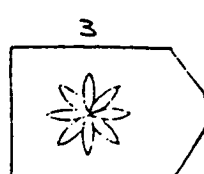
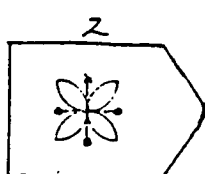
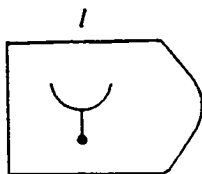
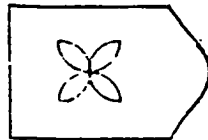
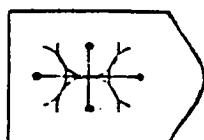
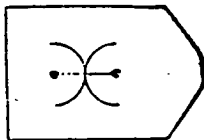
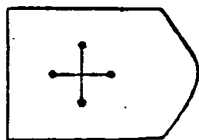
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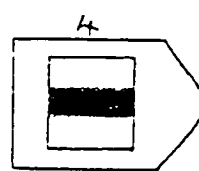
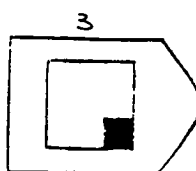
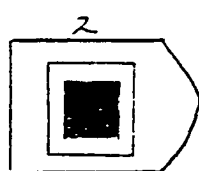
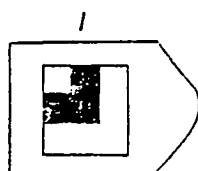
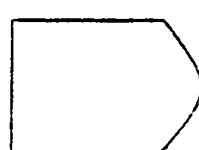
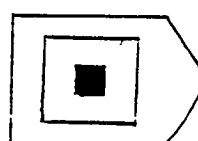
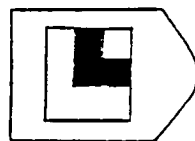
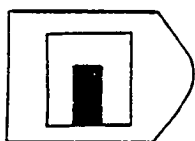
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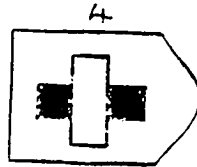
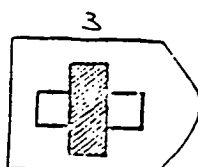
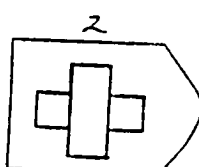
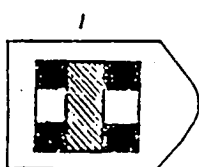
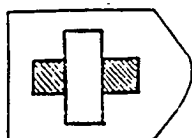
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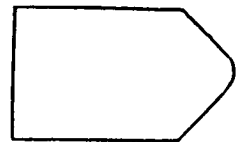
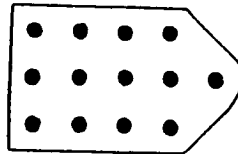
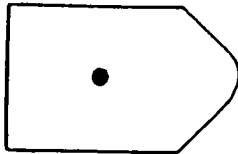
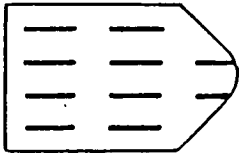
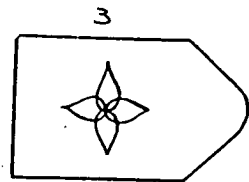
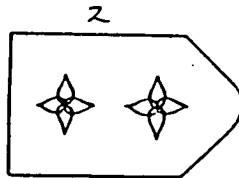
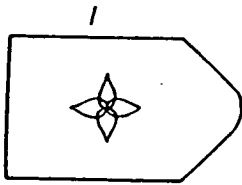
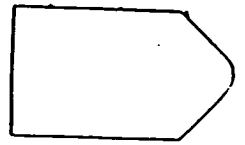
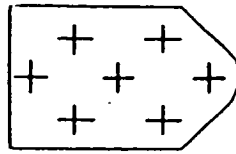
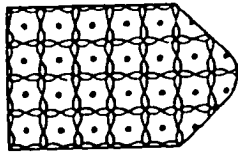
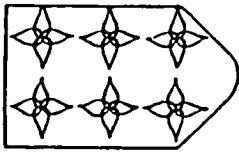
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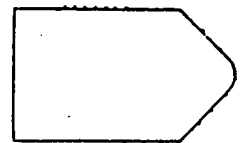
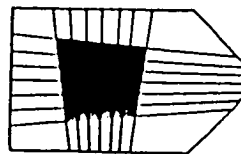
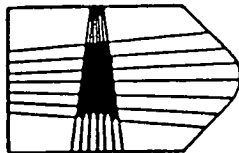
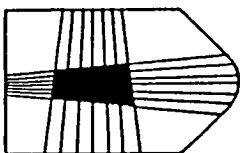
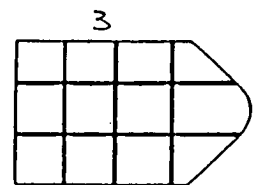
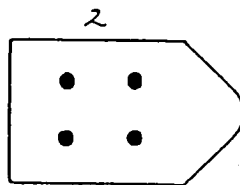
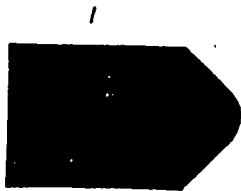
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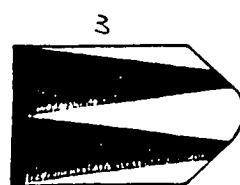
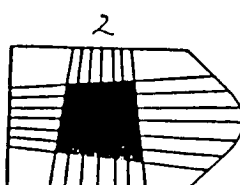
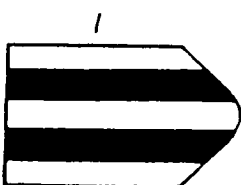
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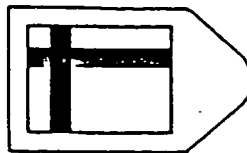
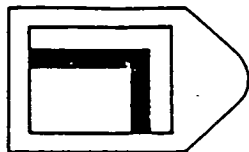
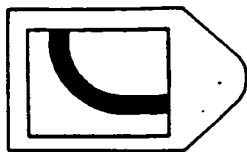
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③



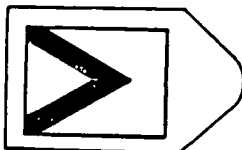
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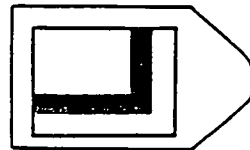
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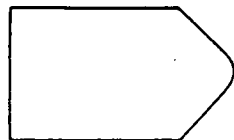
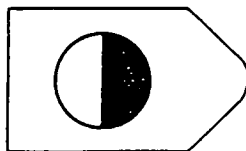
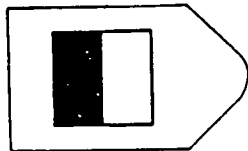
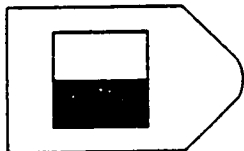
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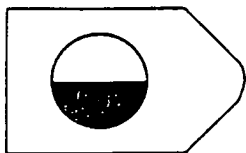
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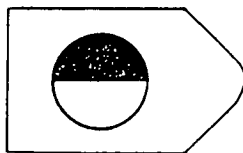
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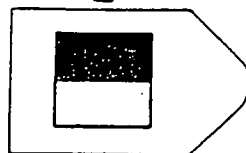
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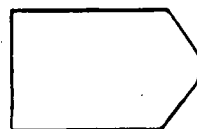
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3



6



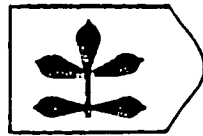
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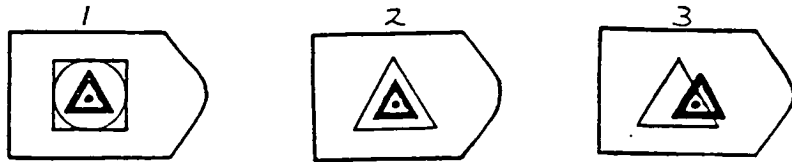
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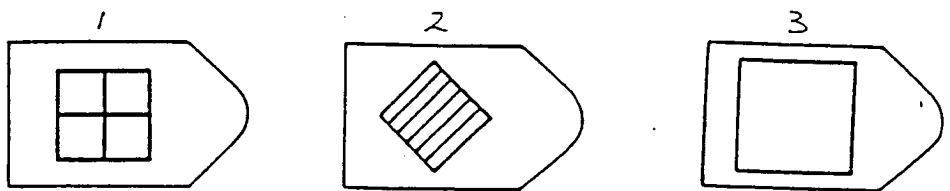
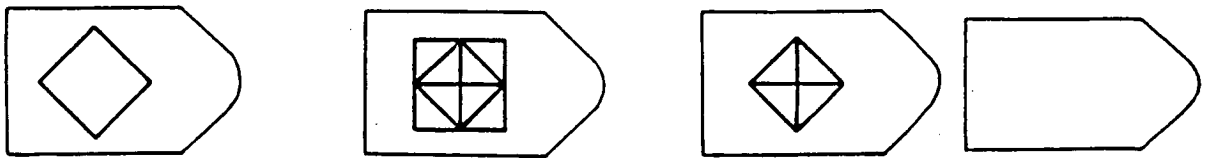
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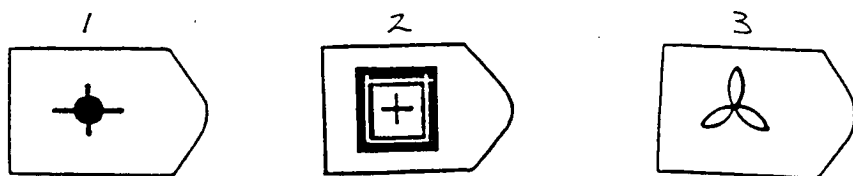
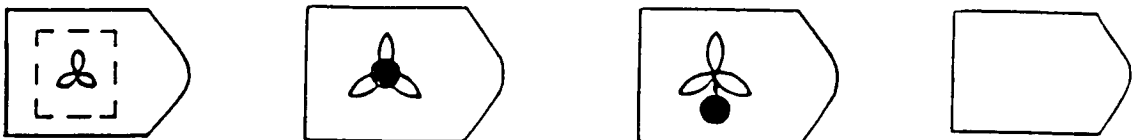
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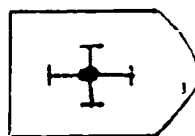
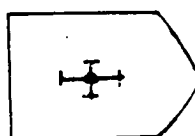
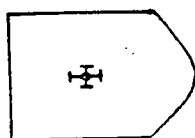
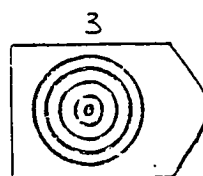
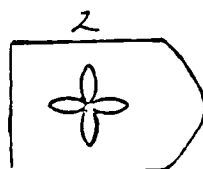
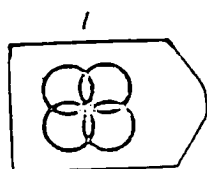
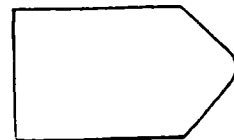
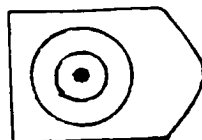
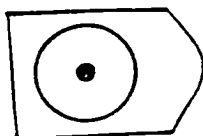
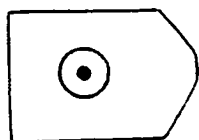
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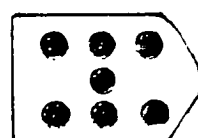
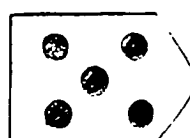
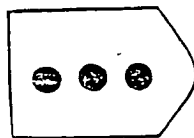
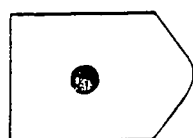
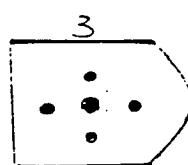
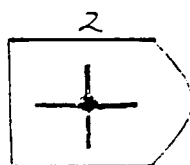
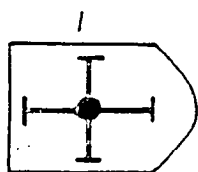
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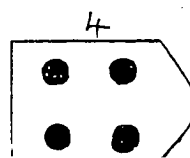
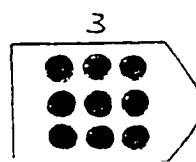
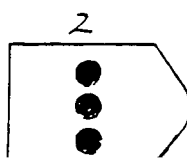
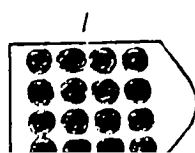


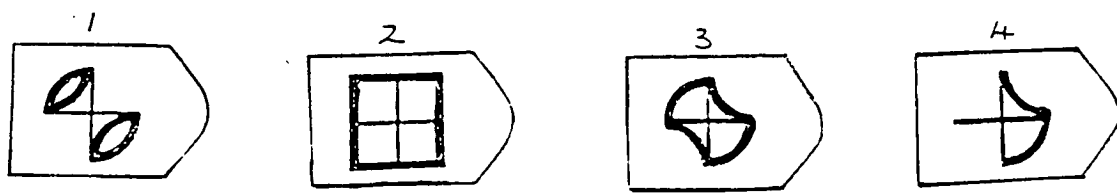
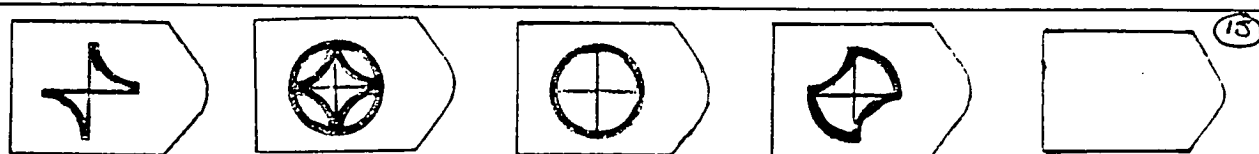
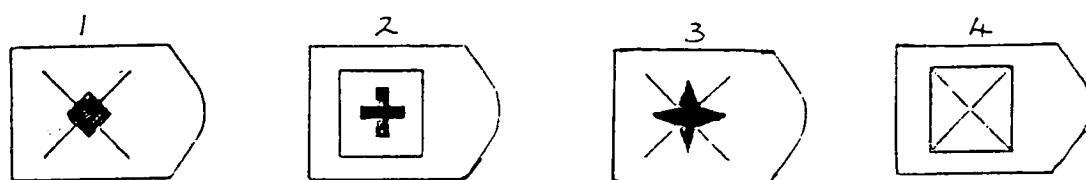
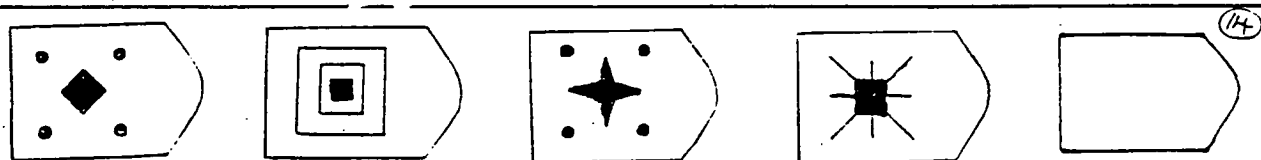
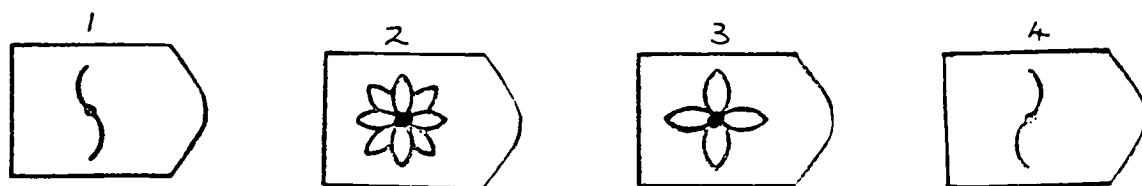
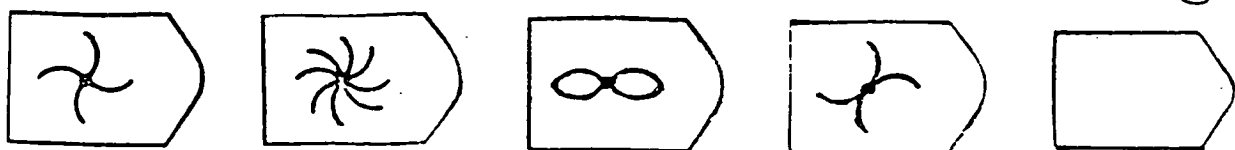


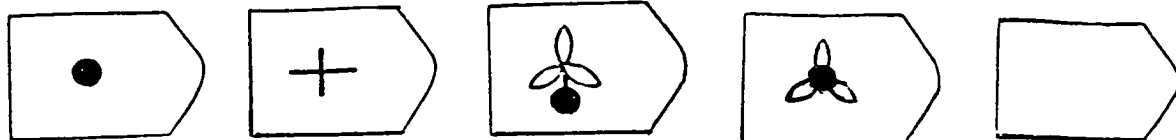
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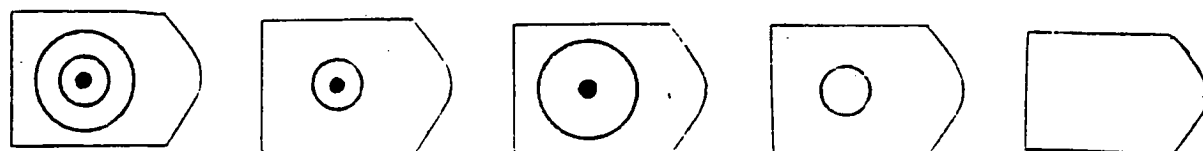
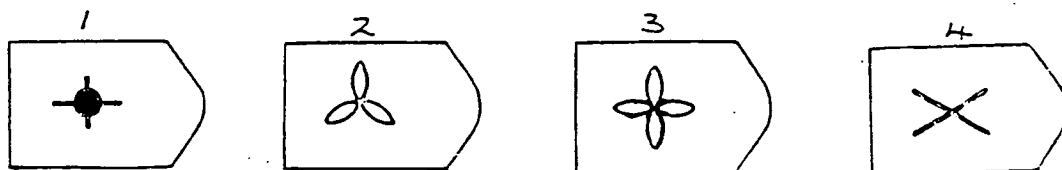
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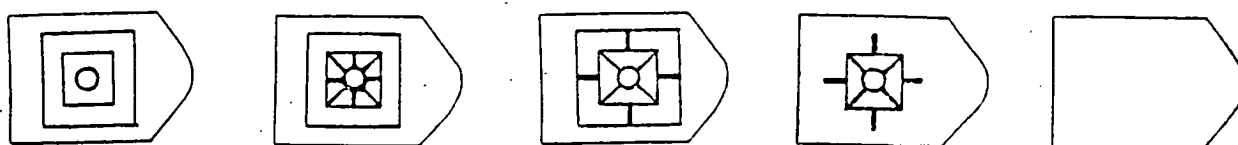
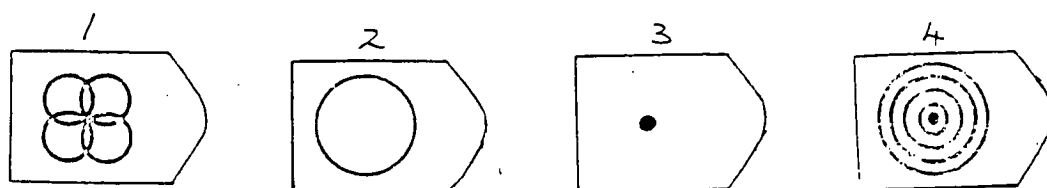




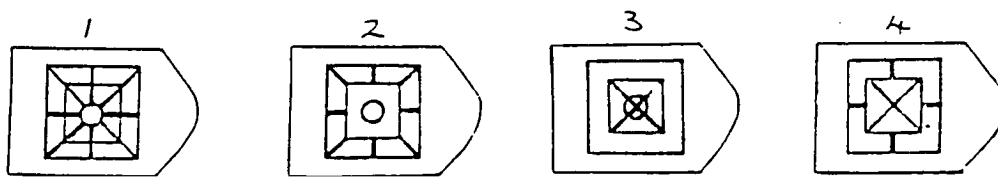
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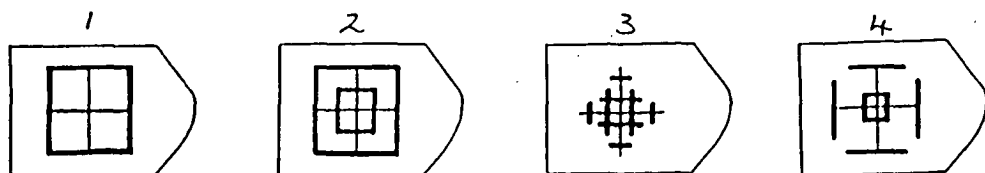
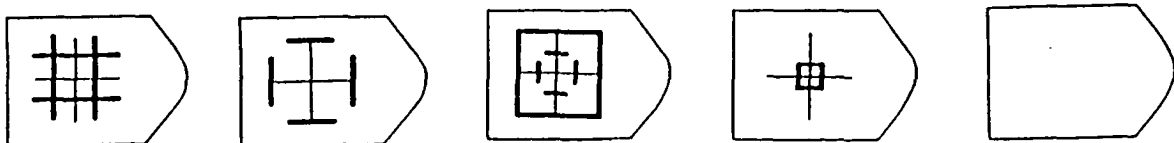
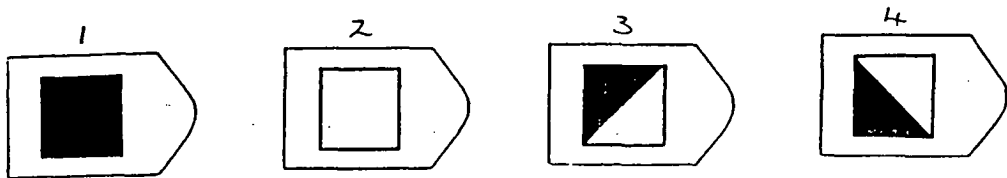
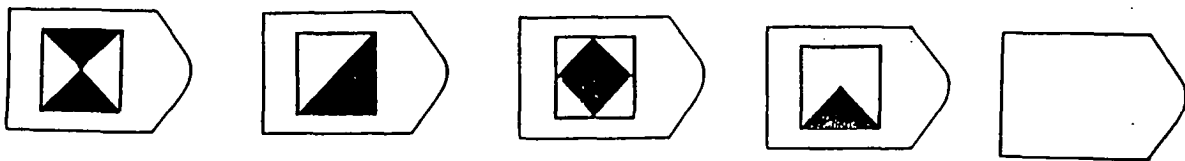
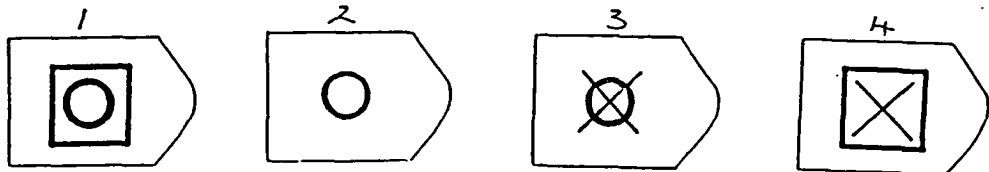
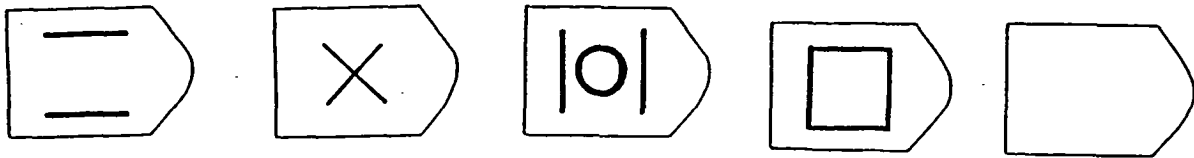


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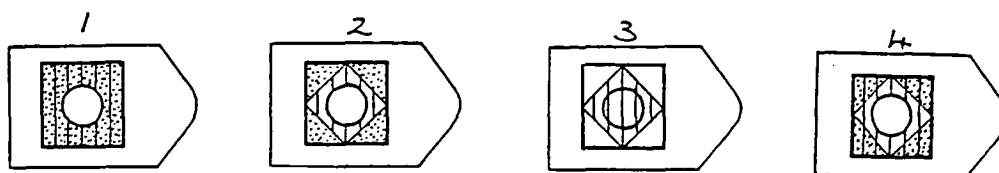
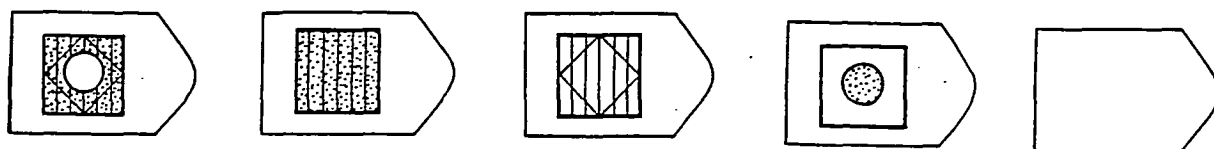


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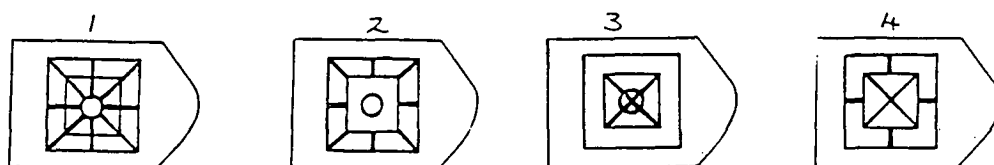
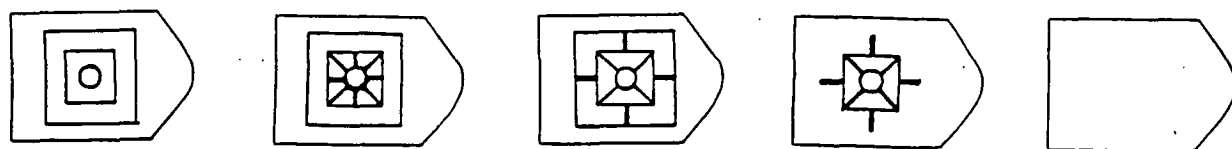




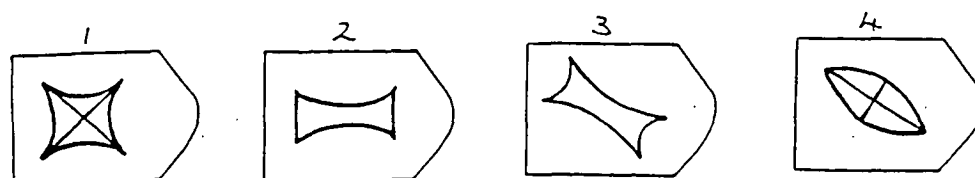
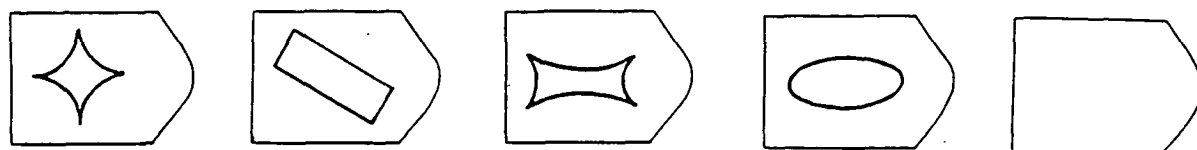
④



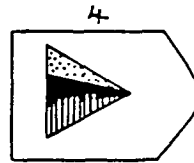
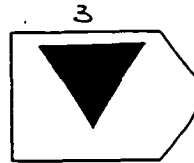
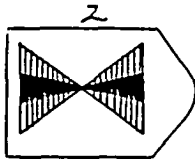
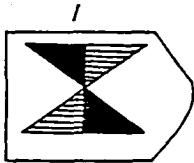
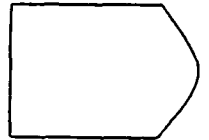
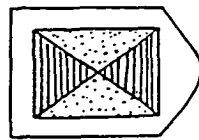
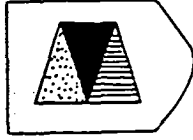
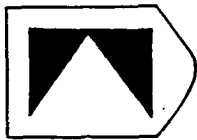
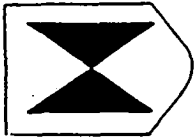
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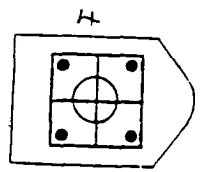
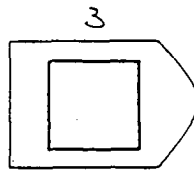
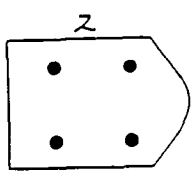
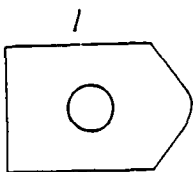
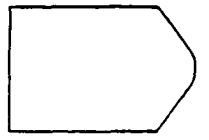
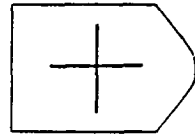
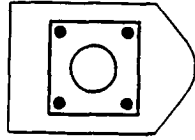
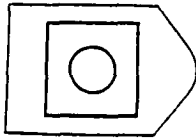
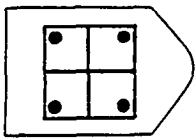
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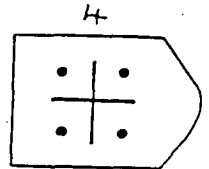
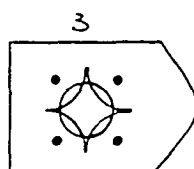
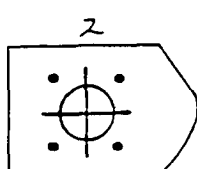
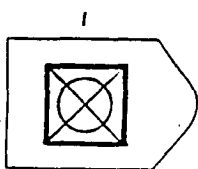
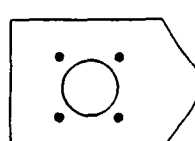
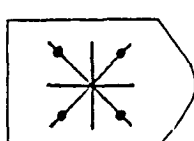
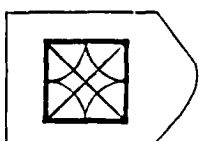
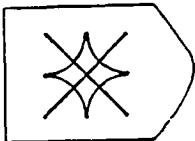
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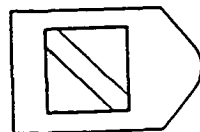
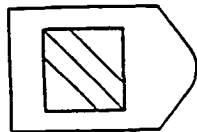
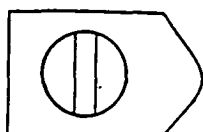
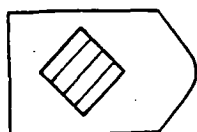
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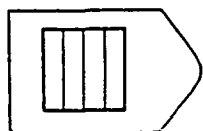
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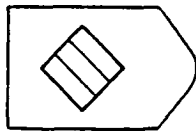
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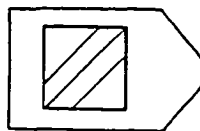
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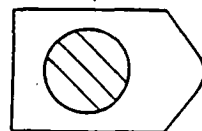
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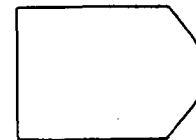
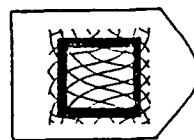
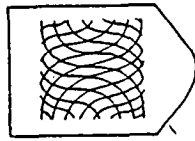
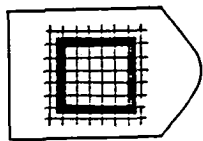
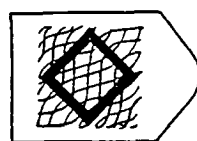
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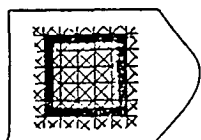
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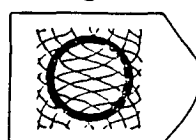
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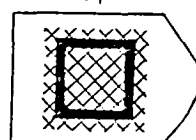
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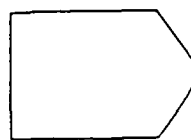
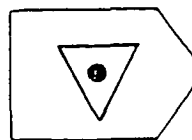
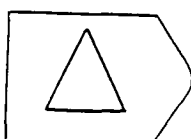
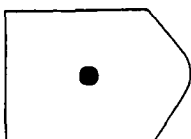
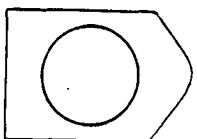
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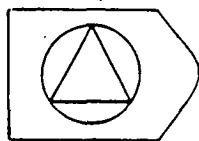
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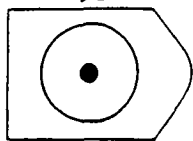
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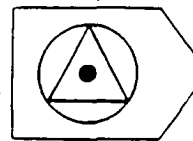
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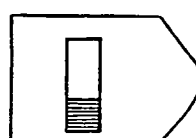
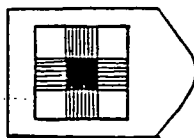
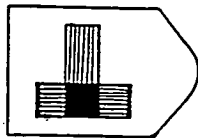
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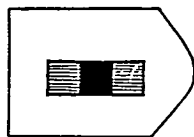
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13



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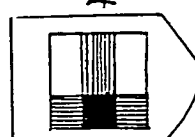
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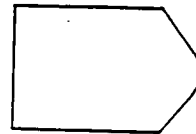
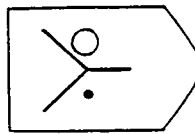
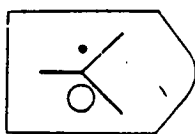
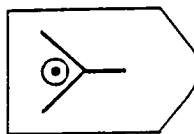
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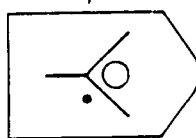
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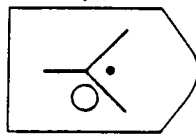
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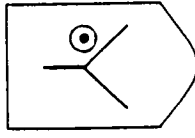
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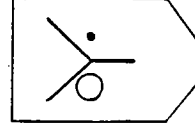
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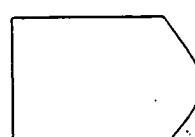
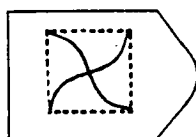
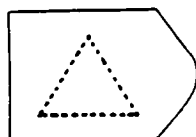
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15



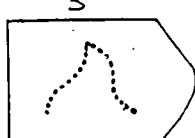
1



2



3



4





APPENDIX 4

ARITHMETIC PROBLEMS

EXPERIMENT 2

Appendix 4.1: Arithmetic Problems - Set A

(i)

$$\begin{array}{r} 58 \\ +25 \\ \hline \end{array} \quad \begin{array}{r} 168 \\ +224 \\ \hline \end{array} \quad \begin{array}{r} 124 \\ +289 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ -5 \\ \hline \end{array} \quad \begin{array}{r} 16 \\ -3 \\ \hline \end{array} \quad \begin{array}{r} 22 \\ -11 \\ \hline \end{array} \quad \begin{array}{r} 78 \\ -19 \\ \hline \end{array} \quad \begin{array}{r} 54 \\ -37 \\ \hline \end{array} \quad \begin{array}{r} 435 \\ -346 \\ \hline \end{array} \quad \begin{array}{r} 521 \\ -188 \\ \hline \end{array}$$

(ii)

$$\begin{array}{r} 46 \\ +37 \\ \hline \end{array} \quad \begin{array}{r} 279 \\ +324 \\ \hline \end{array} \quad \begin{array}{r} 285 \\ +349 \\ \hline \end{array} \quad \begin{array}{r} 627 \\ -116 \\ \hline \end{array} \quad \begin{array}{r} 574 \\ -389 \\ \hline \end{array} \quad \begin{array}{r} 430 \\ -378 \\ \hline \end{array} \quad \begin{array}{r} 600 \\ -418 \\ \hline \end{array} \quad \begin{array}{r} 5418 \\ 1046 \\ +2731 \\ \hline \end{array} \quad \begin{array}{r} 3176 \\ 1985 \\ +2138 \\ \hline \end{array} \quad \begin{array}{r} 540 \\ \times 3 \\ \hline \end{array}$$

(iii)

$$\begin{array}{r} 322 \\ +154 \\ \hline \end{array} \quad \begin{array}{r} 21 \\ 36 \\ +169 \\ \hline \end{array} \quad \begin{array}{r} 348 \\ -126 \\ \hline \end{array} \quad \begin{array}{r} 3914 \\ -2404 \\ \hline \end{array} \quad \begin{array}{r} 32 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 112 \\ \times 4 \\ \hline \end{array} \quad 8 \overline{)188} \quad \begin{array}{r} 3416 \\ 2941 \\ 188 \\ +29 \\ \hline \end{array} \quad \begin{array}{r} 359 \\ -278 \\ \hline \end{array} \quad \begin{array}{r} 2048 \\ -1639 \\ \hline \end{array}$$

$$(371 + 463) - 120 = \underline{\quad\quad\quad} \quad (432 + 398) - 199 = \underline{\quad\quad\quad} \quad \begin{array}{r} 29 \\ \times 7 \\ \hline \end{array} \quad 10 \overline{)2382} \quad \begin{array}{r} 31 \\ \times 9 \\ \hline \end{array}$$

(iv)

$$\begin{array}{r} 462 \\ +379 \\ \hline \end{array} \quad \begin{array}{r} 278 \\ +594 \\ \hline \end{array} \quad \begin{array}{r} 638 \\ -309 \\ \hline \end{array} \quad \begin{array}{r} 477 \\ -289 \\ \hline \end{array} \quad \begin{array}{r} 233 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ \times 3 \\ \hline \end{array} \quad 5 \overline{)525} \quad \begin{array}{r} 394 \\ 261 \\ 37 \\ +1084 \\ \hline \end{array} \quad 2384 + 1095 = \underline{\quad\quad\quad}$$

$$\begin{array}{r} 3784 \\ -1099 \\ \hline \end{array} \quad \begin{array}{r} 389 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 2034 \\ \times 11 \\ \hline \end{array} \quad 16 \overline{)3794} \quad (3874 - 1952) \times 2 = \underline{\quad\quad\quad} \quad 33 \overline{)2985}$$

(v)

$$\begin{array}{r} 3041 \\ 2932 \\ +147 \\ \hline \end{array} \quad \begin{array}{r} 7453 \\ -2894 \\ \hline \end{array} \quad \begin{array}{r} 6427 \\ -3789 \\ \hline \end{array} \quad \begin{array}{r} 142 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 649 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 34 \\ \times 22 \\ \hline \end{array} \quad \begin{array}{r} 127 \\ \times 34 \\ \hline \end{array} \quad \begin{array}{r} 205 \\ \times 36 \\ \hline \end{array} \quad \begin{array}{r} 347 \\ \times 265 \\ \hline \end{array} \quad \begin{array}{r} 439 \\ \times 105 \\ \hline \end{array} \quad \begin{array}{r} 3784 \\ \times 267 \\ \hline \end{array}$$

$$8 \overline{)192} \quad 7 \overline{)163} \quad 24 \overline{)144} \quad 38 \overline{)1057} \quad 23 \overline{)74,76} \quad (29 \times 61) \div 4 = \underline{\quad\quad\quad} \quad (103 \times 28) \div 11 = \underline{\quad\quad\quad}$$

(vi)

$$\begin{array}{r} 3041 \\ 2932 \\ +147 \\ \hline \end{array} \quad \begin{array}{r} 2795 \\ 1028 \\ +3054 \\ \hline \end{array} \quad \begin{array}{r} 7453 \\ -2894 \\ \hline \end{array} \quad \begin{array}{r} 6427 \\ -3789 \\ \hline \end{array} \quad \begin{array}{r} 142 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 1232 \\ \times 3 \\ \hline \end{array} \quad 8 \overline{)1600} \quad 2 \overline{)806} \quad 6429 + 374 + 94 = \underline{\quad\quad\quad}$$

$$(750 + 294) - 308 = \underline{\quad\quad\quad} \quad 4 \overline{)824} \quad 5 \overline{)870} \quad 6 \overline{)373} \quad \begin{array}{r} 64 \\ \times 22 \\ \hline \end{array} \quad \begin{array}{r} 49 \\ \times 13 \\ \hline \end{array} \quad \begin{array}{r} 104 \\ \times 25 \\ \hline \end{array} \quad \begin{array}{r} 141 \\ \times 352 \\ \hline \end{array}$$

$$158 \times 2,4 = \underline{\quad\quad\quad}$$

Appendix 4.2: Arithmetic Problems - Set B

(i)

$$\begin{array}{r} 43 \\ -19 \\ \hline \end{array} \quad \begin{array}{r} 55 \\ -33 \\ \hline \end{array} \quad \begin{array}{r} 60 \\ -32 \\ \hline \end{array} \quad \begin{array}{r} 122 \\ -40 \\ \hline \end{array} \quad \begin{array}{r} 78 \\ -66 \\ \hline \end{array} \quad \begin{array}{r} 530 \\ -224 \\ \hline \end{array} \quad \begin{array}{r} 325 \\ -136 \\ \hline \end{array} \quad \begin{array}{r} 221 \\ -140 \\ \hline \end{array} \quad \begin{array}{r} 46 \\ -35 \\ \hline \end{array} \quad \begin{array}{r} 233 \\ -66 \\ \hline \end{array}$$

(ii)

$$\begin{array}{r} 3104 \\ 2698 \\ +1143 \\ \hline \end{array} \quad \begin{array}{r} 4185 \\ 6391 \\ +2005 \\ \hline \end{array} \quad \begin{array}{r} 3121 \\ 4140 \\ +1238 \\ \hline \end{array} \quad \begin{array}{r} 231 \\ 222 \\ 310 \\ +121 \\ \hline \end{array} \quad \begin{array}{r} 4612 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 121 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 144 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 315 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 141 \\ 232 \\ +406 \\ \hline \end{array} \quad \begin{array}{r} 230 \\ 148 \\ +262 \\ \hline \end{array}$$

(iii)

$$\begin{array}{r} 6315 \\ +2048 \\ \hline \end{array} \quad 3/\overline{704} \quad \begin{array}{r} 3782 \\ +1560 \\ \hline \end{array} \quad 4/\overline{198} \quad 8/\overline{164} \quad \begin{array}{r} 1583 \\ -1295 \\ \hline \end{array} \quad \begin{array}{r} 6325 \\ -5036 \\ \hline \end{array} \quad \begin{array}{r} 65 \\ \times 21 \\ \hline \end{array} \quad \begin{array}{r} 64 \\ \times 33 \\ \hline \end{array}$$

$$\begin{array}{r} 4328 \\ -109 \\ \hline \end{array} \quad \begin{array}{r} 34 \\ \times 2 \\ \hline \end{array} \quad 8/\overline{819} \quad \begin{array}{r} 13 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 203 \\ \times 29 \\ \hline \end{array} \quad \begin{array}{r} 158 \\ \times 64 \\ \hline \end{array}$$

(iv)

$$\begin{array}{r} 146 \\ 281 \\ +195 \\ \hline \end{array} \quad \begin{array}{r} 29 \\ \times 37 \\ \hline \end{array} \quad \begin{array}{r} 46 \\ \times 20 \\ \hline \end{array} \quad 369 + 221 = \underline{\hspace{2cm}} \quad \begin{array}{r} 4387 \\ -2176 \\ \hline \end{array} \quad 9/\overline{985} \quad \begin{array}{r} 234 \\ +148 \\ \hline \end{array} \quad \begin{array}{r} 73 \\ \times 40 \\ \hline \end{array} \quad \begin{array}{r} 4957 \\ -2089 \\ \hline \end{array}$$

$$\begin{array}{r} 341 \\ 14 \\ +286 \\ \hline \end{array} \quad \begin{array}{r} 389 \\ -287 \\ \hline \end{array} \quad 21/\overline{364} \quad \begin{array}{r} 426 \\ 492 \\ +134 \\ \hline \end{array} \quad \begin{array}{r} 37 \\ \times 9 \\ \hline \end{array} \quad 316 + 287 = \underline{\hspace{2cm}}$$

(v)

$$3/\overline{411} \quad 2/\overline{604} \quad 63/\overline{409} \quad 28/\overline{1785} \quad 5/\overline{100} \quad \begin{array}{r} 1765 \\ \times 385 \\ \hline \end{array} \quad \begin{array}{r} 7469 \\ \times 210 \\ \hline \end{array} \quad \begin{array}{r} 48 \\ \times 22 \\ \hline \end{array} \quad \begin{array}{r} 104 \\ \times 36 \\ \hline \end{array}$$

$$\begin{array}{r} 8142 \\ \times 361 \\ \hline \end{array} \quad \begin{array}{r} 1781 \\ +2648 \\ \hline \end{array} \quad \begin{array}{r} 3781 \\ +5410 \\ \hline \end{array} \quad (3041 + 29) \times 37 = \underline{\hspace{2cm}} \quad \begin{array}{r} 392 \\ \times 89 \\ \hline \end{array} \quad (4163 \times 48) \div 13 = \underline{\hspace{2cm}}$$

$$\begin{array}{r} 51 \\ \times 9 \\ \hline \end{array} \quad 4609 - 3054 = \underline{\hspace{2cm}} \quad 25/\overline{63.4}$$

(vi)

$$\begin{array}{r} 741 \\ 283 \\ +159 \\ \hline \end{array} \quad 29/\overline{4043} \quad \begin{array}{r} 8439 \\ -160 \\ \hline \end{array} \quad \begin{array}{r} 159 \\ 243 \\ +1048 \\ \hline \end{array} \quad \begin{array}{r} 3785 \\ \times 12 \\ \hline \end{array} \quad \begin{array}{r} 7594 \\ -2631 \\ \hline \end{array} \quad \begin{array}{r} 37 \\ \times 21 \\ \hline \end{array} \quad 14/\overline{154} \quad \begin{array}{r} 342 \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 3146 \\ 2974 \\ +105 \\ \hline \end{array} \quad \begin{array}{r} 29 \\ \times 37 \\ \hline \end{array} \quad 41/\overline{639} \quad \begin{array}{r} 7812 \\ -6432 \\ \hline \end{array} \quad 6/\overline{366} \quad (28 \times 3) - 46 = \underline{\hspace{2cm}} \quad 24/\overline{785}$$

$$\begin{array}{r} 628 \\ \times 4 \\ \hline \end{array} \quad 24,4 \div 4 = \underline{\hspace{2cm}}$$

46	279	285	9	15	33	67	45	524	632
+37	+324	+349	-6	-4	-22	-18	-28	-335	-277

57	168	396	526	685	320	500	3227	4285	320
+48	+213	+238	-116	-498	-265	-327	2054	1874	x 3
—	—	—	—	—	—	—	+1620	+1137	—

433		+265		9/189		+19		468		3159
<u>32</u>		<u>47</u>		<u>223</u>		<u>176</u>		<u>-388</u>		<u>-2749</u>
-237		-3405		x 2		1832				
<u>459</u>		<u>4925</u>		x 3		2305				
<u>+270</u>						+				

$$\begin{array}{r} \text{---} \\ 482 + 574 = \text{---} \\ 543 + 499 = \text{---} \\ \text{---} \end{array}$$
  

	$\times 7$	<u>30</u>
	$\times 9$	<u>42</u>
<hr/>		
	$\times 7$	<u>10/3493</u>
<hr/>		

<u>351</u>	<u>379</u>	<u>527</u>	<u>588</u>	<u>132</u>	<u>403</u>	<u>283</u>	<u>+1293</u>
+489	+683	-208	-397	x 2	x 3	150	26
<hr/>							
					5/675	1273 + 2106 =	

2675	<u>278</u>	<u>1145</u>	<u>14/4893</u>	(2763 - 1843) × 3 =	<u>44/3996</u>
-1088	× 7	× 12			

								(305 x 37) ÷ 11 =
4152	6362	-1783	-2679	7538	243	538	45	236
+ 369					x 2	x 3	x 21	x 23
1821								
1863	71245	8/429	16/128	23/6317	19/4810	(38 x 52) ÷ 4 =		
x 358								
528	256	x374	x203					

2052	3864	6364	5538	243	1323	9/1809	3/639
+ 258	+ 2155	-1983	-3899	x 2	x 3		
3841	1017						
5538 + 285 + 85 =			(641 + 383) - 209 =			5/725	7/749
29	48	205	152				
x63	x24	x34	x51				
			194 x 3.6 =				6/490

(i)

$$\begin{array}{r} 25 \\ +29 \\ \hline 54 \\ 158 \\ +218 \\ \hline 374 \\ -4 \\ \hline 370 \\ -19 \\ \hline 351 \\ -48 \\ \hline 303 \\ -26 \\ \hline 277 \\ -33 \\ \hline 244 \\ -437 \\ \hline -193 \end{array}$$

(ii)

$$\begin{array}{r} 65 \\ +36 \\ \hline 101 \\ 217 \\ +136 \\ \hline 353 \\ +105 \\ \hline 458 \\ -224 \\ \hline 234 \\ -546 \\ \hline 312 \\ -780 \\ \hline 468 \\ -600 \\ \hline 868 \\ +2841 \\ \hline 3709 \\ +2257 \\ \hline 5966 \end{array}$$

(iii)

$$\begin{array}{r} 544 \\ +376 \\ \hline 920 \\ 43 \\ -348 \\ \hline 572 \\ -4506 \\ \hline 3934 \\ -22 \\ \hline 3912 \\ -322 \\ \hline 3590 \\ -7147 \\ \hline 3882 \\ +21 \\ \hline 3903 \\ -2943 \\ \hline 9060 \\ -497 \\ \hline 8563 \\ -3859 \\ \hline 4704 \end{array}$$

(iv)

$$\begin{array}{r} 573 \\ +601 \\ \hline 1174 \\ 602 \\ +916 \\ \hline 1518 \\ -531 \\ \hline 987 \\ -622 \\ \hline 365 \\ -103 \\ \hline 262 \\ -712 \\ \hline 1910 \\ -585 \\ \hline 1325 \\ +1182 \\ \hline 2507 \\ -172 \\ \hline 2335 \end{array}$$

(v)

$$\begin{array}{r} 3063 \\ +2734 \\ \hline 5797 \\ 4152 \\ -3047 \\ \hline 1145 \\ -2748 \\ \hline 1427 \\ -427 \\ \hline 1000 \\ -61 \\ \hline 939 \\ -215 \\ \hline 724 \\ -405 \\ \hline 319 \end{array}$$

(vi)

$$\begin{array}{r} 1078 \\ +2930 \\ \hline 4008 \\ +543 \\ \hline 4551 \\ 2755 \\ -1029 \\ \hline 1726 \\ -4370 \\ \hline 5447 \\ -3689 \\ \hline 1758 \\ -342 \\ \hline 1416 \\ -1032 \\ \hline 384 \end{array}$$

Appendix 4.5 Arithmetic Problems - Set E

(i)

$$\begin{array}{r} 35 \\ +27 \\ \hline \end{array} \quad \begin{array}{r} 108 \\ +334 \\ \hline \end{array} \quad \begin{array}{r} 564 \\ +147 \\ \hline \end{array} \quad \begin{array}{r} 5 \\ -3 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ -8 \\ \hline \end{array} \quad \begin{array}{r} 74 \\ -53 \\ \hline \end{array} \quad \begin{array}{r} 65 \\ -26 \\ \hline \end{array} \quad \begin{array}{r} 72 \\ -58 \\ \hline \end{array} \quad \begin{array}{r} 238 \\ -149 \\ \hline \end{array} \quad \begin{array}{r} 543 \\ -465 \\ \hline \end{array}$$

(ii)

$$\begin{array}{r} 29 \\ +55 \\ \hline \end{array} \quad \begin{array}{r} 378 \\ +416 \\ \hline \end{array} \quad \begin{array}{r} 196 \\ +438 \\ \hline \end{array} \quad \begin{array}{r} 738 \\ -227 \\ \hline \end{array} \quad \begin{array}{r} 563 \\ -475 \\ \hline \end{array} \quad \begin{array}{r} 540 \\ -387 \\ \hline \end{array} \quad \begin{array}{r} 300 \\ -264 \\ \hline \end{array} \quad \begin{array}{r} 3429 \\ 1054 \\ +3731 \\ \hline \end{array} \quad \begin{array}{r} 2165 \\ 1844 \\ +1312 \\ \hline \end{array} \quad \begin{array}{r} 210 \\ \times 3 \\ \hline \end{array}$$

(iii)

$$\begin{array}{r} 364 \\ +435 \\ \hline \end{array} \quad \begin{array}{r} 32 \\ 47 \\ +258 \\ \hline \end{array} \quad \begin{array}{r} 758 \\ -548 \\ \hline \end{array} \quad \begin{array}{r} 4716 \\ -2306 \\ \hline \end{array} \quad \begin{array}{r} 231 \\ \times 3 \\ \hline \end{array} \quad 7 \overline{)147} \quad \begin{array}{r} 2528 \\ 245 \\ 670 \\ +43 \\ \hline \end{array} \quad \begin{array}{r} 437 \\ -266 \\ \hline \end{array} \quad \begin{array}{r} 5054 \\ -3685 \\ \hline \end{array}$$

$$(294 + 169) - 272 = \underline{\quad} \quad (301 + 274) - 182 = \underline{\quad} \quad \begin{array}{r} 42 \\ \times 7 \\ \hline \end{array} \quad 10 \overline{)6941} \quad \begin{array}{r} 28 \\ \times 9 \\ \hline \end{array}$$

(iv)

$$\begin{array}{r} 345 \\ +174 \\ \hline \end{array} \quad \begin{array}{r} 428 \\ +369 \\ \hline \end{array} \quad \begin{array}{r} 747 \\ -589 \\ \hline \end{array} \quad \begin{array}{r} 326 \\ -158 \\ \hline \end{array} \quad \begin{array}{r} 321 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 204 \\ \times 2 \\ \hline \end{array} \quad 5 \overline{)450} \quad \begin{array}{r} 273 \\ 261 \\ 140 \\ +37 \\ \hline \end{array} \quad 328 + 1095 = \underline{\quad}$$

$$\begin{array}{r} 4136 \\ -2099 \\ \hline \end{array} \quad \begin{array}{r} 214 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 3136 \\ \times 11 \\ \hline \end{array} \quad 18 \overline{)5842} \quad (4178 - 3694) \times 2 = \underline{\quad} \quad 37 \overline{)2649}$$

(v)

$$\begin{array}{r} 4052 \\ 1823 \\ +258 \\ \hline \end{array} \quad \begin{array}{r} 8544 \\ -3705 \\ \hline \end{array} \quad \begin{array}{r} 7538 \\ -4899 \\ \hline \end{array} \quad \begin{array}{r} 134 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 358 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 45 \\ \times 23 \\ \hline \end{array} \quad \begin{array}{r} 136 \\ \times 28 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ \times 29 \\ \hline \end{array} \quad \begin{array}{r} 258 \\ \times 178 \\ \hline \end{array} \quad \begin{array}{r} 548 \\ \times 104 \\ \hline \end{array}$$

$$\begin{array}{r} 3883 \\ \times 178 \\ \hline \end{array} \quad 8 \overline{)200} \quad 7 \overline{)254} \quad 25 \overline{)675} \quad 21 \overline{)2354} \quad 32 \overline{)74,76} \quad (32 \times 43) \div 4 = \underline{\quad}$$

$$(102 \times 14) \div 8 = \underline{\quad}$$

(vi)

$$\begin{array}{r} 2532 \\ 1681 \\ +405 \\ \hline \end{array} \quad \begin{array}{r} 3786 \\ 2039 \\ +2458 \\ \hline \end{array} \quad \begin{array}{r} 6453 \\ -2845 \\ \hline \end{array} \quad \begin{array}{r} 3789 \\ -2894 \\ \hline \end{array} \quad \begin{array}{r} 243 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 1322 \\ \times 3 \\ \hline \end{array} \quad 7 \overline{)1421} \quad 3 \overline{)963}$$

$$6318 + 282 + 37 = \underline{\quad} \quad (750 + 182) - 344 = \underline{\quad} \quad 4 \overline{)832} \quad 5 \overline{)630} \quad 8 \overline{)391}$$

$$\begin{array}{r} 65 \\ \times 31 \\ \hline \end{array} \quad \begin{array}{r} 42 \\ \times 13 \\ \hline \end{array} \quad \begin{array}{r} 104 \\ \times 32 \\ \hline \end{array} \quad \begin{array}{r} 129 \\ \times 342 \\ \hline \end{array} \quad 146 \times 32 = \underline{\quad}$$

(1)

$\frac{26}{-17}$	$\frac{44}{-13}$	$\frac{50}{-22}$	$\frac{124}{-30}$	$\frac{99}{-74}$	$\frac{460}{-237}$	$\frac{236}{-147}$	$\frac{342}{-250}$	$\frac{57}{-34}$	$\frac{344}{-77}$
------------------	------------------	------------------	-------------------	------------------	--------------------	--------------------	--------------------	------------------	-------------------

(11)

$\frac{4203}{1587}$	$\frac{3294}{5281}$	$\frac{4232}{3130}$	$\frac{321}{311}$	$\frac{2321}{6}$	$\frac{232}{3}$	$\frac{241}{2}$	$\frac{236}{2}$	$\frac{252}{121}$	$\frac{340}{259}$
---------------------	---------------------	---------------------	-------------------	------------------	-----------------	-----------------	-----------------	-------------------	-------------------

(111)

$\frac{4215}{3048}$	$\frac{3}{642}$	$\frac{4784}{1560}$	$\frac{8}{241}$	$\frac{8}{164}$	$\frac{1492}{1009}$	$\frac{6315}{5406}$	$\frac{64}{32}$	$\frac{23}{49}$
---------------------	-----------------	---------------------	-----------------	-----------------	---------------------	---------------------	-----------------	-----------------

(11v)

$\frac{342}{184}$	$\frac{43}{21}$	$\frac{58}{30}$	$\frac{3785}{1496}$	$\frac{320 + 113}{7785}$	$\frac{342}{159}$	$\frac{32}{20}$	$\frac{6482}{4591}$
-------------------	-----------------	-----------------	---------------------	--------------------------	-------------------	-----------------	---------------------

(v)

$\frac{3}{426}$	$\frac{2}{818}$	$\frac{63}{415}$	$\frac{18}{1940}$	$\frac{8}{144}$	$\frac{1432}{274}$	$\frac{7648}{210}$	$\frac{34}{22}$	$\frac{205}{29}$
-----------------	-----------------	------------------	-------------------	-----------------	--------------------	--------------------	-----------------	------------------

$\frac{4346}{271}$	$\frac{1872}{3459}$	$\frac{2692}{4140}$	$\frac{(2504 + 36) \times 24}{414}$	$\frac{(2163 \times 28) \div 13}{414}$
--------------------	---------------------	---------------------	-------------------------------------	--

(vi)

$\frac{231}{157}$	$\frac{33}{1874}$	$\frac{7649}{2130}$	$\frac{321}{146}$	$\frac{5841}{12}$	$\frac{8637}{2584}$	$\frac{43}{21}$	$\frac{14}{286}$	$\frac{423}{3}$	$\frac{2741}{105}$	$\frac{34}{26}$
-------------------	-------------------	---------------------	-------------------	-------------------	---------------------	-----------------	------------------	-----------------	--------------------	-----------------

(1)

$$\begin{array}{r} 46 \\ +18 \\ \hline 249 \\ +102 \\ \hline 653 \\ -7 \\ \hline 9 \\ -6 \\ \hline 19 \\ -24 \\ \hline 85 \\ -64 \\ \hline 72 \\ -46 \\ \hline 95 \\ -229 \\ \hline 468 \\ -287 \\ \hline 754 \end{array}$$

(!!!)

$$\begin{array}{r} 39 \\ +22 \\ \hline 368 \\ +245 \\ \hline 374 \\ +156 \\ \hline 535 \\ -114 \\ \hline 463 \\ -275 \\ \hline 463 \\ -377 \\ \hline 520 \\ -329 \\ \hline 500 \\ +1811 \\ \hline 4307 \\ +3257 \\ \hline 2165 \\ +1842 \\ \hline 230 \\ \times 3 \end{array}$$

(!!!!)

$$\begin{array}{r} 658 \\ +341 \\ \hline 204 \\ +161 \\ \hline 258 \\ -147 \\ \hline 3914 \\ -2901 \\ \hline 23 \\ \times 2 \\ \hline 122 \\ \times 3 \\ \hline 9/279 \end{array}$$

$$(319 + 194) - 108 = \underline{\hspace{2cm}} \quad (241 + 364) - 142 = \underline{\hspace{2cm}}$$

$$\begin{array}{r} 34 \\ \times 7 \\ \hline 24 \\ \times 9 \end{array}$$

(1V)

$$\begin{array}{r} 374 \\ +268 \\ \hline 309 \\ +547 \\ \hline 627 \\ -409 \\ \hline 283 \\ \times 3 \\ \hline 133 \\ \times 3 \\ \hline 540 \\ \times 3 \\ \hline 5/275 \end{array}$$

$$\begin{array}{r} 1884 \\ +1097 \\ \hline 271 \\ \times 8 \\ \hline 1371 \\ \times 12 \\ \hline 13/2795 \end{array}$$

$$(4281 - 1462) \times 2 = \underline{\hspace{2cm}} \quad 28/7418$$

(V)

$$\begin{array}{r} 3426 \\ 1945 \\ +307 \\ \hline 6328 \\ -4409 \\ \hline 421 \\ -2368 \\ \hline 421 \\ \times 2 \\ \hline 304 \\ \times 3 \\ \hline 64 \\ \times 28 \\ \hline 128 \\ \times 31 \\ \hline 205 \\ \times 24 \\ \hline 146 \\ \times 324 \\ \hline 329 \\ \times 105 \\ \hline 2874 \\ \times 168 \end{array}$$

$$9/243 \quad 6/364 \quad 30/660 \quad 22/3412 \quad 31/8319 \quad (11 \times 24) \div 3 = \underline{\hspace{2cm}} \quad (98 \times 15) \div 6 = \underline{\hspace{2cm}}$$

(VI)

$$\begin{array}{r} 3412 \\ 1709 \\ +308 \\ \hline 6485 \\ -3159 \\ \hline 2684 \\ -2495 \\ \hline 144 \\ \times 2 \\ \hline 2330 \\ \times 3 \\ \hline 6/3624 \end{array}$$

$$4/816$$

$$3421 + 345 + 21 = \underline{\hspace{2cm}}$$

$$243 \times 2.8 = \underline{\hspace{2cm}}$$

$$(680 + 234) - 291 = \underline{\hspace{2cm}} \quad 9/810 \quad 5/455 \quad 8/261 \quad 23 \quad \times 24 \quad 43 \quad \times 12 \quad 105 \quad \times 27 \quad 184 \quad \times 311$$



APPENDIX 5

ARITHMETIC PROBLEMS

EXPERIMENT 3

Appendix 5.1: Arithmetic Problems - Set A

(i)

$$\begin{array}{r} 68 \\ +29 \\ \hline \end{array} \quad \begin{array}{r} 24 \\ 16 \\ 22 \\ +11 \\ \hline \end{array} \quad \begin{array}{r} 104 \\ 31 \\ +27 \\ \hline \end{array} \quad \begin{array}{r} 25 \\ -12 \\ \hline \end{array} \quad \begin{array}{r} 58 \\ -29 \\ \hline \end{array} \quad \begin{array}{r} 37 \\ -22 \\ \hline \end{array} \quad \begin{array}{r} 60 \\ -13 \\ \hline \end{array} \quad \begin{array}{r} 27 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 162 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ \times 14 \\ \hline \end{array} \quad 12 \div 5 = \underline{\hspace{2cm}}$$

$$96 \div 3 = \underline{\hspace{2cm}} \quad 48 \div 12 = \underline{\hspace{2cm}} \quad (16 + 22) - 12 = \underline{\hspace{2cm}} \quad (42 - 31) + (76 - 0) = \underline{\hspace{2cm}}$$

(ii)

$$\begin{array}{r} 37 \\ 21 \\ +46 \\ \hline \end{array} \quad \begin{array}{r} 156 \\ 412 \\ +21 \\ \hline \end{array} \quad \begin{array}{r} 317 \\ -64 \\ \hline \end{array} \quad \begin{array}{r} 296 \\ -37 \\ \hline \end{array} \quad \begin{array}{r} 47 \\ -25 \\ \hline \end{array} \quad \begin{array}{r} 274 \\ -168 \\ \hline \end{array} \quad \begin{array}{r} 6735 \\ -2968 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 22 \\ \times 4 \\ \hline \end{array} \quad \begin{array}{r} 45 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 675 \\ \times 45 \\ \hline \end{array}$$

$$\begin{array}{r} 308 \\ \times 79 \\ \hline \end{array} \quad \begin{array}{r} 6005 \\ -2768 \\ \hline \end{array} \quad (47 \times 34) + 10 = \underline{\hspace{2cm}} \quad (180 \times 11) - 21 = \underline{\hspace{2cm}}$$

(iii)

$$\begin{array}{r} 3045 \\ 621 \\ 5945 \\ +3010 \\ \hline \end{array} \quad \begin{array}{r} 7438 \\ -6049 \\ \hline \end{array} \quad \begin{array}{r} 173 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 28 \\ \times 36 \\ \hline \end{array} \quad \begin{array}{r} 405 \\ \times 32 \\ \hline \end{array} \quad \begin{array}{r} 368 \\ \times 123 \\ \hline \end{array} \quad 34/\overline{5695} \quad 68/\overline{3789} \quad (119 \div 7) + 43 = \underline{\hspace{2cm}}$$

$$(203 \times 12) - 109 = \underline{\hspace{2cm}} \quad (31 \times 42) \div 3 = \underline{\hspace{2cm}} \quad (24 \times 18) \div 12 = \underline{\hspace{2cm}} \quad 42/\overline{2940}$$

$$31/\overline{9362} \quad 20/\overline{5844}$$

(iv)

$$\begin{array}{r} 347 \\ 619 \\ 402 \\ +1795 \\ \hline \end{array} \quad \begin{array}{r} 1043 \\ 2974 \\ +100 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ -216 \\ \hline \end{array} \quad \begin{array}{r} 472 \\ -385 \\ \hline \end{array} \quad \begin{array}{r} 642 \\ \times 27 \\ \hline \end{array} \quad \begin{array}{r} 279 \\ \times 143 \\ \hline \end{array} \quad 12/\overline{108} \quad 37/\overline{1065} \quad 64/\overline{21534}$$

$$4/\overline{63} \quad (769 + 12) \div 3 = \underline{\hspace{2cm}} \quad \text{What is } 1/3 \text{ of } \$1,89? \quad (29 \times 61) \div 4 = \underline{\hspace{2cm}}$$

$$(103 \times 28) \div 11 = \underline{\hspace{2cm}} \quad 23/\overline{7476}$$

(v)

$$\begin{array}{r} 3045 \\ 621 \\ 5954 \\ +1003 \\ \hline \end{array} \quad \begin{array}{r} 6245 \\ -3989 \\ \hline \end{array} \quad \begin{array}{r} 3945 \\ -274 \\ \hline \end{array} \quad \begin{array}{r} 15 \\ \times 4 \\ \hline \end{array} \quad \begin{array}{r} 510 \\ \times 9 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 54 \\ \times 28 \\ \hline \end{array} \quad \begin{array}{r} 27 \\ \times 30 \\ \hline \end{array} \quad \begin{array}{r} 236 \\ \times 42 \\ \hline \end{array} \quad \begin{array}{r} 470 \\ \times 44 \\ \hline \end{array}$$

$$5/\overline{250} \quad 9/\overline{1881} \quad 11/\overline{758} \quad \text{What is } 1/3 \text{ of } \$1,86?$$

If I have \$2,94 and give  $\frac{1}{2}$  of it away, how much money will I have left?

(vii)

$$\begin{array}{r} 371 \\ \times 23 \\ \hline \end{array}$$

$$\begin{array}{r} 401 \\ \times 53 \\ \hline \end{array}$$

$$65 \overline{)3984}$$

$$109 \overline{)27148}$$

$$\begin{array}{r} 464 \\ \times 48 \\ \hline \end{array}$$

$$\begin{array}{r} 23 \\ \times 30 \\ \hline \end{array}$$

$$37 \overline{)6795}$$

$$\begin{array}{r} 2.33 \\ +5.03 \\ \hline \end{array}$$

$$\begin{array}{r} 6.02 \\ +3.08 \\ \hline \end{array}$$

$$\begin{array}{r} 1.36 \\ \times 1.5 \\ \hline \end{array}$$

$$\begin{array}{r} 8.43 \\ \times 2.4 \\ \hline \end{array}$$

$$1/4 + 3/8 = \underline{\hspace{1cm}}$$

$$2/3 + 1/9 - 1/2 = \underline{\hspace{1cm}}$$

What is 10% of 120?

If I have \$30.63 and give  $2/3$  of it away, and then find \$5.50, how much money will I have?

Appendix 5.2: Arithmetic Problems - Set B

(i)

$$\begin{array}{r} 3104 \\ 2698 \\ +1143 \\ \hline \end{array} \quad \begin{array}{r} 4185 \\ 6391 \\ +2005 \\ \hline \end{array} \quad \begin{array}{r} 354 \\ -296 \\ \hline \end{array} \quad \begin{array}{r} 413 \\ -108 \\ \hline \end{array} \quad \begin{array}{r} 1006 \\ -312 \\ \hline \end{array} \quad \begin{array}{r} 60 \\ \times 13 \\ \hline \end{array} \quad \begin{array}{r} 144 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 315 \\ \times 2 \\ \hline \end{array} \quad 3/407 \quad 12/97$$

$$\begin{array}{r} 31 \\ \times 11 \\ \hline \end{array} \quad \begin{array}{r} 4612 \\ \times 6 \\ \hline \end{array} \quad 5/\overline{114} \quad \begin{array}{r} 125 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 360 \\ \times 4 \\ \hline \end{array}$$

(ii)

$$\begin{array}{r} 3142 \\ 206 \\ 1579 \\ +6041 \\ \hline \end{array} \quad \begin{array}{r} 2941 \\ 3520 \\ 1410 \\ +398 \\ \hline \end{array} \quad \begin{array}{r} 64 \\ 105 \\ 516 \\ +409 \\ \hline \end{array} \quad \begin{array}{r} 2641 \\ 3942 \\ +198 \\ \hline \end{array} \quad \begin{array}{r} 21 \\ \times 15 \\ \hline \end{array} \quad \begin{array}{r} 107 \\ \times 9 \\ \hline \end{array} \quad \begin{array}{r} 859 \\ \times 25 \\ \hline \end{array} \quad 21 \times 16 = \quad \begin{array}{r} 552 \\ -32 \\ \hline \end{array}$$

$$\begin{array}{r} 4718 \\ -4659 \\ \hline \end{array} \quad \begin{array}{r} 5431 \\ -988 \\ \hline \end{array} \quad \begin{array}{r} 7042 \\ -3957 \\ \hline \end{array} \quad 5/\overline{114} \quad \begin{array}{r} 125 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 307 \\ \times 5 \\ \hline \end{array}$$

(iii)

$$\begin{array}{r} 7328 \\ -5709 \\ \hline \end{array} \quad \begin{array}{r} 6001 \\ -3984 \\ \hline \end{array} \quad \begin{array}{r} 4320 \\ -1088 \\ \hline \end{array} \quad \begin{array}{r} 705 \\ \times 26 \\ \hline \end{array} \quad \begin{array}{r} 393 \\ \times 401 \\ \hline \end{array} \quad \begin{array}{r} 1064 \\ \times 29 \\ \hline \end{array} \quad 7/\overline{4977} \quad 16/\overline{3052} \quad 12/\overline{1560}$$

$$(124 \times 12) + 301 = \quad (178 \times 10) - 412 = \quad \begin{array}{r} 364 \\ \times 149 \\ \hline \end{array} \quad \begin{array}{r} 250 \\ \times 98 \\ \hline \end{array} \quad 23/\overline{4623}$$

What is  $7/8$  of \$1,12?

(iv)

$$5/\overline{100} \quad 63/\overline{409} \quad 1785 \div 28 = \quad 322/\overline{4061} \quad \begin{array}{r} 392 \\ \times 89 \\ \hline \end{array} \quad (4163 \times 48) \div 13 =$$

$$\begin{array}{r} 1064 \\ \times 291 \\ \hline \end{array} \quad \begin{array}{r} 3878 \\ \times 943 \\ \hline \end{array} \quad 24/\overline{120} \quad 334 \div 64 = \quad \begin{array}{r} 205 \\ \times 190 \\ \hline \end{array} \quad \text{What is } 4/5 \text{ of } 640?$$

What is  $1/2$  of 1059?  $(342 \times 27) \div 43 =$   $1.69 \times 2.8 =$

(v)

$$\begin{array}{r} 7492 \\ -3005 \\ \hline \end{array} \quad \begin{array}{r} 8904 \\ -6413 \\ \hline \end{array} \quad \begin{array}{r} 203 \\ \times 36 \\ \hline \end{array} \quad \begin{array}{r} 241 \\ \times 194 \\ \hline \end{array} \quad \begin{array}{r} 3004 \\ \times 15 \\ \hline \end{array} \quad \begin{array}{r} 642 \\ \times 220 \\ \hline \end{array} \quad 95/\overline{4059} \quad 81/\overline{4392} \quad 39/\overline{645}$$

$$(205 \div 5) + 63 = \quad 6.4 + 2.8 = \quad 3.1 + 4.2 = \quad 1/2 + 1 \frac{1}{2} =$$

What is  $3/4$  of \$1,68? What is  $5/8$  of \$12,48?

(vi)

$$\begin{array}{r} 4,8 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 7,46 \\ \times 1,39 \\ \hline \end{array} \quad \begin{array}{r} 1,57 \\ \times 2,00 \\ \hline \end{array} \quad 2,2/\overline{3,64} \quad 1,5/\overline{7,05} \quad (739 \div 16) \times 24 = \underline{\hspace{2cm}}$$

$$3/4 \div 1/5 = \underline{\hspace{2cm}} \quad 1 \frac{1}{2} \div 2/9 = \underline{\hspace{2cm}} \quad 1/2 \times 3/4 = \underline{\hspace{2cm}} \quad 1 \frac{1}{3} \times 1/3 = \underline{\hspace{2cm}}$$

$$\text{What is 20\% of 200?} \quad \text{What is 45\% of 830?} \quad 16/\overline{3216} \quad 63/\overline{4792} \quad 15/\overline{4,09}$$

Appendix 5.3: Arithmetic Problems - Set C

(i)

$$\begin{array}{r} 57 \\ +34 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ 24 \\ 17 \\ +10 \\ \hline \end{array} \quad \begin{array}{r} 107 \\ 42 \\ +29 \\ \hline \end{array} \quad \begin{array}{r} 37 \\ -14 \\ \hline \end{array} \quad \begin{array}{r} 74 \\ -48 \\ \hline \end{array} \quad \begin{array}{r} 56 \\ -33 \\ \hline \end{array} \quad \begin{array}{r} 40 \\ -27 \\ \hline \end{array} \quad \begin{array}{r} 34 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 274 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 44 \\ \times 16 \\ \hline \end{array} \quad 14 \div 6 = \underline{\hspace{2cm}}$$

$$84 \div 4 = \underline{\hspace{2cm}} \quad 55 \div 5 = \underline{\hspace{2cm}} \quad (24 + 37) - 19 = \underline{\hspace{2cm}} \quad (37 - 29) + (84 - 6) = \underline{\hspace{2cm}}$$

(ii)

$$\begin{array}{r} 53 \\ 28 \\ +37 \\ \hline \end{array} \quad \begin{array}{r} 247 \\ 534 \\ +35 \\ \hline \end{array} \quad \begin{array}{r} 242 \\ -76 \\ \hline \end{array} \quad \begin{array}{r} 358 \\ -49 \\ \hline \end{array} \quad \begin{array}{r} 58 \\ -16 \\ \hline \end{array} \quad \begin{array}{r} 365 \\ -249 \\ \hline \end{array} \quad \begin{array}{r} 4587 \\ -998 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 54 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 458 \\ \times 35 \\ \hline \end{array}$$

$$\begin{array}{r} 404 \\ \times 68 \\ \hline \end{array} \quad \begin{array}{r} 4010 \\ -2876 \\ \hline \end{array} \quad (58 \times 5) + 16 = \underline{\hspace{2cm}} \quad (135 \times 12) - 142 = \underline{\hspace{2cm}}$$

(iii)

$$\begin{array}{r} 4371 \\ 745 \\ 5302 \\ +3109 \\ \hline \end{array} \quad \begin{array}{r} 7495 \\ -3807 \\ \hline \end{array} \quad \begin{array}{r} 235 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 35 \\ \times 74 \\ \hline \end{array} \quad \begin{array}{r} 307 \\ \times 56 \\ \hline \end{array} \quad \begin{array}{r} 149 \\ \times 381 \\ \hline \end{array} \quad 27/\overline{5940} \quad 73/\overline{826} \quad (432 \div 4) + 164 = \underline{\hspace{2cm}}$$

$$(394 \times 11) - 205 = \underline{\hspace{2cm}} \quad (24 \times 61) \div 4 = \underline{\hspace{2cm}} \quad (35 \times 16) \div 11 = \underline{\hspace{2cm}} \quad 25/\overline{5496}$$

$$17/\overline{5168} \quad 40/\overline{6395}$$

(iv)

$$\begin{array}{r} 416 \\ 259 \\ 307 \\ +1843 \\ \hline \end{array} \quad \begin{array}{r} 1027 \\ 3842 \\ +201 \\ \hline \end{array} \quad \begin{array}{r} 605 \\ -516 \\ \hline \end{array} \quad \begin{array}{r} 724 \\ -538 \\ \hline \end{array} \quad \begin{array}{r} 462 \\ \times 34 \\ \hline \end{array} \quad \begin{array}{r} 182 \\ \times 234 \\ \hline \end{array} \quad 12/\overline{132} \quad 43/\overline{3206} \quad 57/\overline{16429} \quad 6/\overline{95}$$

$$(428 + 207) \div 4 = \underline{\hspace{2cm}} \quad \text{What is } 1/4 \text{ of } \$2.68? \quad (92 \times 16) \div 5 = \underline{\hspace{2cm}}$$

$$(207 \times 19) \div 12 = \underline{\hspace{2cm}} \quad 32/\overline{6774}$$

(v)

$$\begin{array}{r} 7435 \\ 791 \\ 9455 \\ +3100 \\ \hline \end{array} \quad \begin{array}{r} 3041 \\ -2764 \\ \hline \end{array} \quad \begin{array}{r} 4935 \\ -746 \\ \hline \end{array} \quad \begin{array}{r} 17 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 210 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 74 \\ \times 33 \\ \hline \end{array} \quad \begin{array}{r} 36 \\ \times 40 \\ \hline \end{array} \quad \begin{array}{r} 316 \\ \times 73 \\ \hline \end{array} \quad \begin{array}{r} 320 \\ \times 33 \\ \hline \end{array} \quad 8/\overline{480}$$

$$7/\overline{2156} \quad 12/\overline{695} \quad \text{What is } 1/4 \text{ of } \$3.36?$$

If I have 69c and give 1/3 of it away, how much will I have left?

(vi)

$$\begin{array}{r} 713 \\ \times 32 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ \times 49 \\ \hline \end{array} \quad 84 \overline{)5376} \quad 121 \overline{)57842} \quad \begin{array}{r} 232 \\ \times 54 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ \times 50 \\ \hline \end{array} \quad 41 \overline{)8439} \quad \begin{array}{r} 1.24 \\ + 3.06 \\ \hline \end{array} \quad \begin{array}{r} 7.05 \\ + 4.07 \\ \hline \end{array}$$

$$\begin{array}{r} 2.43 \\ \times 1.9 \\ \hline \end{array} \quad \begin{array}{r} 7.64 \\ \times 3.5 \\ \hline \end{array} \quad 2/5 + 6/10 = \underline{\quad} \quad 3/4 + 1/2 - 1/8 = \underline{\quad} \quad \text{What is 25\% of 100?}$$

If I have \$15.45 and give  $2/5$  of it away, and then lose another \$1.45, how much money will I have left?

Appendix 5.4: Arithmetic Problems - Set D

(i)

$$\begin{array}{r} 54 \\ +38 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ 37 \\ +13 \\ \hline \end{array} \quad \begin{array}{r} 109 \\ 37 \\ +26 \\ \hline \end{array} \quad \begin{array}{r} 46 \\ -34 \\ \hline \end{array} \quad \begin{array}{r} 75 \\ -58 \\ \hline \end{array} \quad \begin{array}{r} 56 \\ -24 \\ \hline \end{array} \quad \begin{array}{r} 90 \\ -74 \\ \hline \end{array} \quad \begin{array}{r} 45 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 242 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 44 \\ \times 18 \\ \hline \end{array} \quad 25 \div 6 = \underline{\quad}$$

$$56 \div 4 = \underline{\quad} \quad 110 \div 10 = \underline{\quad} \quad (37 + 42) - 24 = \underline{\quad} \quad (76 + 42) - 31 = \underline{\quad}$$

(ii)

$$\begin{array}{r} 45 \\ 36 \\ +58 \\ \hline \end{array} \quad \begin{array}{r} 233 \\ 142 \\ +53 \\ \hline \end{array} \quad \begin{array}{r} 428 \\ -75 \\ \hline \end{array} \quad \begin{array}{r} 384 \\ -178 \\ \hline \end{array} \quad \begin{array}{r} 64 \\ -43 \\ \hline \end{array} \quad \begin{array}{r} 589 \\ -549 \\ \hline \end{array} \quad \begin{array}{r} 3576 \\ -1787 \\ \hline \end{array} \quad \begin{array}{r} 7 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 15 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 87 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 394 \\ \times 58 \\ \hline \end{array} \quad \begin{array}{r} 407 \\ \times 64 \\ \hline \end{array}$$

$$\begin{array}{r} 3090 \\ -2896 \\ \hline \end{array} \quad (58 \times 4) + 36 = \underline{\quad} \quad (190 \times 12) - 49 = \underline{\quad}$$

(iii)

$$\begin{array}{r} 5642 \\ 371 \\ 4245 \\ +1029 \\ \hline \end{array} \quad \begin{array}{r} 3695 \\ -2108 \\ \hline \end{array} \quad \begin{array}{r} 137 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 37 \\ \times 82 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ \times 27 \\ \hline \end{array} \quad \begin{array}{r} 582 \\ \times 312 \\ \hline \end{array} \quad 43/\overline{6955} \quad 42/\overline{7426} \quad (315 \div 5) + 121 = \underline{\quad}$$

$$(312 \times 12) - 63 = \underline{\quad} \quad (62 \times 34) \div 2 = \underline{\quad} \quad (32 \times 17) \div 10 = \underline{\quad}$$

$$25/\overline{3750} \quad 24/\overline{4824} \quad 30/\overline{6416}$$

(iv)

$$\begin{array}{r} 716 \\ 412 \\ 378 \\ +2742 \\ \hline \end{array} \quad \begin{array}{r} 3081 \\ 2947 \\ +204 \\ \hline \end{array} \quad \begin{array}{r} 505 \\ -217 \\ \hline \end{array} \quad \begin{array}{r} 782 \\ -595 \\ \hline \end{array} \quad \begin{array}{r} 358 \\ \times 46 \\ \hline \end{array} \quad \begin{array}{r} 364 \\ \times 235 \\ \hline \end{array} \quad 11/\overline{121} \quad 63/\overline{4925} \quad 51/\overline{73604} \quad 6/\overline{74}$$

$$(342 + 586) \div 7 = \underline{\quad} \quad \text{What is } 1/7 \text{ of } \$2.17? \quad (44 \times 83) \div 5 = \underline{\quad}$$

$$(106 \times 39) \div 12 = \underline{\quad} \quad 62/\overline{5174}$$

(v)

$$\begin{array}{r} 7329 \\ 145 \\ 6328 \\ +5041 \\ \hline \end{array} \quad \begin{array}{r} 3742 \\ -1865 \\ \hline \end{array} \quad \begin{array}{r} 4718 \\ -909 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 310 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 203 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 39 \\ \times 47 \\ \hline \end{array} \quad \begin{array}{r} 69 \\ \times 50 \\ \hline \end{array} \quad \begin{array}{r} 474 \\ \times 61 \\ \hline \end{array} \quad \begin{array}{r} 320 \\ \times 66 \\ \hline \end{array} \quad 8/\overline{168} \quad 7/\overline{2863}$$

$$12/\overline{495} \quad \text{What is } 1/5 \text{ of } \$2.55?$$

If I have \$1.42 and give 1/2 of it away, how much money will I have left?



(vi)

$$\begin{array}{r} 436 \\ \times 19 \\ \hline \end{array} \quad \begin{array}{r} 308 \\ \times 47 \\ \hline \end{array} \quad 58/\overline{4762} \quad 131/\overline{45963} \quad \begin{array}{r} 379 \\ \times 54 \\ \hline \end{array} \quad \begin{array}{r} 32 \\ \times 30 \\ \hline \end{array} \quad 61/\overline{3945} \quad \begin{array}{r} 1.66 \\ + 5.02 \\ \hline \end{array} \quad \begin{array}{r} 5.04 \\ + 2.30 \\ \hline \end{array} \quad \begin{array}{r} 2.50 \\ \times 1.6 \\ \hline \end{array}$$

$$\begin{array}{r} 7.41 \\ \times 3.7 \\ \hline \end{array} \quad \frac{1}{6} + \frac{2}{3} = \underline{\quad} \quad \frac{1}{2} + \frac{5}{8} - \frac{2}{3} = \underline{\quad} \quad \text{What is 5\% of \$150?}$$

If I have \$8.11 and give away  $\frac{5}{7}$  of it, how much money will I have left?

# Appendix 5.5: Arithmetic Problems - Set B

(1)

$$\begin{array}{r} 35 \\ +48 \\ \hline 83 \\ 23 \\ 17 \\ 41 \\ +12 \\ \hline 104 \\ 37 \\ -34 \\ \hline 46 \\ 47 \\ -28 \\ \hline 46 \\ -22 \\ \hline 50 \\ -24 \\ \hline 36 \\ \times 3 \\ \hline 213 \\ \times 5 \\ \hline 23 \\ \times 14 \\ \hline 315 \end{array}$$

$69 \div 3 =$   $44 \div 11 =$   $(22 + 12) - 16 =$   $(31 + 76) - (42 + 10) =$

(11)

$$\begin{array}{r} 73 \\ 34 \\ +63 \\ \hline 149 \\ 310 \\ +20 \\ \hline 243 \\ -56 \\ \hline 185 \\ -57 \\ \hline 74 \\ -23 \\ \hline 353 \\ -126 \\ \hline 4625 \\ -1837 \\ \hline 6 \\ \times 7 \\ \hline 33 \\ \times 6 \\ \hline 45 \\ \times 8 \\ \hline 315 \end{array}$$

$(24 \times 3) + 12 =$   $(18 \times 10) - 36 =$

(111)

$$\begin{array}{r} 2056 \\ 5384 \\ \times 7 \\ \hline 184 \\ 29 \\ \times 37 \\ \hline 306 \\ 254 \\ \times 133 \\ \hline 32/4793 \\ 55/3897 \\ \hline (124 \div 4) + 36 = \end{array}$$

$(25 \times 12) - 206 =$   $(24 \times 43) \div 5 =$   $(34 \times 16) \div 11 =$   $31/3540$   $36/7236$

$40/6594$

(1V)

$$\begin{array}{r} 243 \\ 1042 \\ 204 \\ -117 \\ \hline 378 \\ 256 \\ \times 34 \\ \hline 265 \\ \times 134 \\ \hline 12/132 \\ 32/1049 \\ 43/28574 \end{array}$$

$5/63$   $(342 + 36) \div 4 =$   $\text{What is } 1/4 \text{ of } 88?$   $(24 \times 13) \div 4 =$

$(103 \times 11) \div 11 =$   $1/2 + 3/4 =$

(V)

$$\begin{array}{r} 2798 \\ 3394 \\ -2805 \\ \hline 6742 \\ 16 \\ \times 5 \\ \hline 230 \\ 206 \\ \times 5 \\ \hline 47 \\ \times 23 \\ \hline 27 \\ \times 20 \\ \hline 263 \\ \times 41 \\ \hline 308 \\ \times 55 \\ \hline 8/648 \end{array}$$

$10/1010$   $12/792$   $\text{What is } 1/3 \text{ of } \$2.19?$

If I have \$1.78 and give 1/2 of it away, how much money will I have left?

(vi)

$$\begin{array}{r} 262 \\ \times 32 \\ \hline \end{array}$$

$$\begin{array}{r} 305 \\ \times 34 \\ \hline \end{array}$$

$$57 \overline{) 9764}$$

$$103 \overline{) 14786}$$

$$\begin{array}{r} 232 \\ \times 29 \\ \hline \end{array}$$

$$\begin{array}{r} 35 \\ \times 50 \\ \hline \end{array}$$

$$65 \overline{) 7916}$$

$$\begin{array}{r} 4.21 \\ + 6.05 \\ \hline \end{array}$$

$$\begin{array}{r} 3.01 \\ + 2.09 \\ \hline \end{array}$$

$$\begin{array}{r} 1.25 \\ \times 1.4 \\ \hline \end{array}$$

$$\begin{array}{r} 7.36 \\ \times 2.0 \\ \hline \end{array}$$

$$1/5 + 4/15 = \underline{\hspace{2cm}}$$

$$1/3 + 4/9 - 1/4 = \underline{\hspace{2cm}}$$

What is 20% of 200?

If I have \$20.64 and give  $3/4$  of it away, and then find \$3.60, how much money will I have?

Appendix 5.6: Arithmetic Problems - Set F

(i)

$$\begin{array}{r} 2106 \\ 3748 \\ +1231 \\ \hline \end{array} \quad \begin{array}{r} 4126 \\ 4381 \\ +3050 \\ \hline \end{array} \quad \begin{array}{r} 253 \\ -167 \\ \hline \end{array} \quad \begin{array}{r} 216 \\ -109 \\ \hline \end{array} \quad \begin{array}{r} 2040 \\ -213 \\ \hline \end{array} \quad \begin{array}{r} 50 \\ \times 24 \\ \hline \end{array} \quad \begin{array}{r} 236 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 246 \\ \times 2 \\ \hline \end{array} \quad 4/\overline{209} \quad 11/\overline{57}$$

$$\begin{array}{r} 23 \\ \times 12 \\ \hline \end{array} \quad \begin{array}{r} 5313 \\ \times 7 \\ \hline \end{array} \quad 7/\overline{215} \quad \begin{array}{r} 134 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 640 \\ \times 6 \\ \hline \end{array}$$

(ii)

$$\begin{array}{r} 2152 \\ 304 \\ 2176 \\ +5029 \\ \hline \end{array} \quad \begin{array}{r} 1422 \\ 3410 \\ 5620 \\ +489 \\ \hline \end{array} \quad \begin{array}{r} 34 \\ 204 \\ 486 \\ +308 \\ \hline \end{array} \quad \begin{array}{r} 3411 \\ 2917 \\ +177 \\ \hline \end{array} \quad \begin{array}{r} 21 \\ \times 16 \\ \hline \end{array} \quad \begin{array}{r} 204 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 363 \\ \times 34 \\ \hline \end{array} \quad 34 \times 18 = \quad \begin{array}{r} 461 \\ -31 \\ \hline \end{array}$$

$$\begin{array}{r} 3627 \\ -1538 \\ \hline \end{array} \quad \begin{array}{r} 4755 \\ -865 \\ \hline \end{array} \quad \begin{array}{r} 6037 \\ -4249 \\ \hline \end{array} \quad 6/\overline{224} \quad \begin{array}{r} 234 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 402 \\ \times 6 \\ \hline \end{array}$$

(iii)

$$\begin{array}{r} 7427 \\ -5609 \\ \hline \end{array} \quad \begin{array}{r} 5002 \\ -3975 \\ \hline \end{array} \quad \begin{array}{r} 5710 \\ -2064 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ \times 34 \\ \hline \end{array} \quad \begin{array}{r} 247 \\ \times 126 \\ \hline \end{array} \quad \begin{array}{r} 2039 \\ \times 34 \\ \hline \end{array} \quad 8/\overline{4832} \quad 15/\overline{2795} \quad 13/\overline{6342} \quad \begin{array}{r} 474 \\ \times 233 \\ \hline \end{array}$$

$$\begin{array}{r} 340 \\ \times 75 \\ \hline \end{array} \quad 41/\overline{8241} \quad (146 \times 11) + 324 = \quad (178 \div 2) + 714 = \quad \text{What is } 5/9 \text{ of } \$3.69?$$

(iv)

$$6/\overline{120} \quad 34/\overline{502} \quad 1649 \div 37 = \quad 341/\overline{5067} \quad \begin{array}{r} 339 \\ \times 67 \\ \hline \end{array} \quad (2178 \times 56) \div 12 = \quad \begin{array}{r} 3074 \\ \times 381 \\ \hline \end{array}$$

$$\begin{array}{r} 7614 \\ \times 643 \\ \hline \end{array} \quad 17/\overline{136} \quad 641 \div 35 = \quad \begin{array}{r} 304 \\ \times 270 \\ \hline \end{array} \quad \text{What is } 2/5 \text{ of } 250? \quad \text{What is } 1/2 \text{ of } 747?$$

$$(341 \times 17) \div 26 = \quad 1.29 \times 3.7 =$$

(v)

$$\begin{array}{r} 6794 \\ -2004 \\ \hline \end{array} \quad \begin{array}{r} 3407 \\ -2346 \\ \hline \end{array} \quad \begin{array}{r} 207 \\ \times 29 \\ \hline \end{array} \quad \begin{array}{r} 352 \\ \times 165 \\ \hline \end{array} \quad \begin{array}{r} 2050 \\ \times 37 \\ \hline \end{array} \quad \begin{array}{r} 628 \\ \times 290 \\ \hline \end{array} \quad 48/\overline{3975} \quad 82/\overline{6574} \quad 37/\overline{566}$$

$$(355 \div 5) + 112 = \quad 6.5 + 3.8 = \quad 2.6 + 3.2 = \quad 1/4 + 2 \frac{1}{4} =$$

$$\text{What is } 2/3 \text{ of } \$1.59? \quad \text{What is } 4/9 \text{ of } \$1.89?$$

(vi)

$$\begin{array}{r} 3.5 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 4.76 \\ \times 1.93 \\ \hline \end{array} \quad \begin{array}{r} 1.75 \\ \times 3.00 \\ \hline \end{array} \quad 1.6/\overline{2.46} \quad 1.5/\overline{5.05} \quad (316 \div 4) \times 13 = \quad 2/3 \times 1 \frac{1}{2} =$$

$$4/9 \times 1/4 = \quad 1/4 \times 3/8 = \quad 2 \frac{1}{2} \times 1/2 = \quad \text{What is } 25\% \text{ of } 200?$$

$$\text{What is } 35\% \text{ of } 380? \quad 18/\overline{5490} \quad 36/\overline{7492} \quad 14/\overline{3.65}$$

Appendix 5.7: Arithmetic Problems - Set G

(i)

$$\begin{array}{r} 36 \\ +49 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ 34 \\ 18 \\ +11 \\ \hline \end{array} \quad \begin{array}{r} 106 \\ 55 \\ +24 \\ \hline \end{array} \quad \begin{array}{r} 74 \\ -41 \\ \hline \end{array} \quad \begin{array}{r} 63 \\ -37 \\ \hline \end{array} \quad \begin{array}{r} 65 \\ -42 \\ \hline \end{array} \quad \begin{array}{r} 50 \\ -34 \\ \hline \end{array} \quad \begin{array}{r} 28 \\ \times 4 \\ \hline \end{array} \quad \begin{array}{r} 246 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 22 \\ \times 14 \\ \hline \end{array} \quad 15 \div 6 = \underline{\quad}$$

$$48 \div 4 = \underline{\quad} \quad 66 \div 6 = \underline{\quad} \quad (33 + 19) - 37 = \underline{\quad} \quad (84 - 6) + (29 - 1) = \underline{\quad}$$

(ii)

$$\begin{array}{r} 37 \\ 29 \\ +44 \\ \hline \end{array} \quad \begin{array}{r} 356 \\ 234 \\ +29 \\ \hline \end{array} \quad \begin{array}{r} 343 \\ -65 \\ \hline \end{array} \quad \begin{array}{r} 258 \\ -49 \\ \hline \end{array} \quad \begin{array}{r} 47 \\ -34 \\ \hline \end{array} \quad \begin{array}{r} 265 \\ -137 \\ \hline \end{array} \quad \begin{array}{r} 4587 \\ -1698 \\ \hline \end{array} \quad \begin{array}{r} 11 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 44 \\ \times 4 \\ \hline \end{array} \quad \begin{array}{r} 53 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 236 \\ \times 24 \\ \hline \end{array}$$

$$\begin{array}{r} 103 \\ \times 57 \\ \hline \end{array} \quad \begin{array}{r} 3020 \\ -1435 \\ \hline \end{array} \quad (27 \times 3) + 10 = \underline{\quad} \quad (12 \times 12) - 142 = \underline{\quad}$$

(iii)

$$\begin{array}{r} 3765 \\ 477 \\ 5294 \\ +1390 \\ \hline \end{array} \quad \begin{array}{r} 7346 \\ -2587 \\ \hline \end{array} \quad \begin{array}{r} 352 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 28 \\ \times 46 \\ \hline \end{array} \quad \begin{array}{r} 406 \\ \times 35 \\ \hline \end{array} \quad \begin{array}{r} 145 \\ \times 241 \\ \hline \end{array} \quad 26/\overline{5347} \quad 53/\overline{862} \quad (432 \div 8) + 150 = \underline{\quad}$$

$$(275 \times 11) - 169 = \underline{\quad} \quad (54 \times 26) \div 4 = \underline{\quad} \quad (31 \times 17) \div 10 = \underline{\quad} \quad 35/\overline{6590} \quad 38/\overline{7638}$$

$$40/\overline{2688}$$

(iv)

$$\begin{array}{r} 164 \\ 207 \\ 315 \\ +1765 \\ \hline \end{array} \quad \begin{array}{r} 1329 \\ 2468 \\ +300 \\ \hline \end{array} \quad \begin{array}{r} 307 \\ -228 \\ \hline \end{array} \quad \begin{array}{r} 473 \\ -185 \\ \hline \end{array} \quad \begin{array}{r} 342 \\ \times 22 \\ \hline \end{array} \quad \begin{array}{r} 213 \\ \times 46 \\ \hline \end{array} \quad 11/\overline{132} \quad 24/\overline{3594} \quad 27/\overline{27694} \quad 6/\overline{70}$$

$$(312 - 56) \div 3 = \underline{\quad} \quad \text{What is } 1/3 \text{ of } \$1,56? \quad (13 \times 5) \div 2 = \underline{\quad} \quad (12 \times 10) \div 6 = \underline{\quad}$$

$$42/\overline{6138}$$

(v)

$$\begin{array}{r} 3765 \\ 494 \\ 5644 \\ +2400 \\ \hline \end{array} \quad \begin{array}{r} 2341 \\ -1460 \\ \hline \end{array} \quad \begin{array}{r} 3936 \\ -546 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ \times 4 \\ \hline \end{array} \quad \begin{array}{r} 260 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 47 \\ \times 32 \\ \hline \end{array} \quad \begin{array}{r} 27 \\ \times 50 \\ \hline \end{array} \quad \begin{array}{r} 417 \\ \times 46 \\ \hline \end{array} \quad \begin{array}{r} 360 \\ \times 28 \\ \hline \end{array} \quad 4/\overline{660}$$

$$8/\overline{3208} \quad 12/\overline{749} \quad \text{What is } 1/4 \text{ of } 76 \text{ cents?}$$

If I have 39 cents and give  $1/3$  of it away, how much money will I have left?

(vi)

$$\begin{array}{r} 317 \\ \times 23 \\ \hline \end{array} \quad \begin{array}{r} 403 \\ \times 94 \\ \hline \end{array} \quad 48 \overline{)3567} \quad 221 \overline{)57248} \quad \begin{array}{r} 535 \\ \times 287 \\ \hline \end{array} \quad \begin{array}{r} 47 \\ \times 20 \\ \hline \end{array} \quad 62 \overline{)5946} \quad \begin{array}{r} 1.35 \\ +4.03 \\ \hline \end{array} \quad \begin{array}{r} 5.04 \\ +2.07 \\ \hline \end{array}$$

$$\begin{array}{r} 4.32 \\ \times 1.6 \\ \hline \end{array} \quad \begin{array}{r} 5.49 \\ \times 3.7 \\ \hline \end{array} \quad 3/5 + 4/10 = \underline{\quad} \quad 5/12 + 3/4 - 3/8 = \underline{\quad} \quad \text{What is 30\% of 100?}$$

If I have \$10.45 and give  $1/5$  of it away, and then lose another \$2.00, how much money will I have left?

Appendix 5.8: Arithmetic Problems - Set H

(i)

$$\begin{array}{r} 43 \\ +38 \\ \hline \end{array} \quad \begin{array}{r} 21 \\ 17 \\ 34 \\ +19 \\ \hline \end{array} \quad \begin{array}{r} 203 \\ 42 \\ +36 \\ \hline \end{array} \quad \begin{array}{r} 37 \\ -25 \\ \hline \end{array} \quad \begin{array}{r} 64 \\ -38 \\ \hline \end{array} \quad \begin{array}{r} 46 \\ -22 \\ \hline \end{array} \quad \begin{array}{r} 50 \\ -24 \\ \hline \end{array} \quad \begin{array}{r} 37 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 216 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 44 \\ \times 15 \\ \hline \end{array} \quad 16 \div 5 = \underline{\hspace{2cm}}$$

$69 \div 3 = \underline{\hspace{2cm}}$      $96 \div 12 = \underline{\hspace{2cm}}$      $(15 + 32) - 14 = \underline{\hspace{2cm}}$      $(54 - 23) + (56 - 4) = \underline{\hspace{2cm}}$

(ii)

$$\begin{array}{r} 64 \\ 32 \\ +39 \\ \hline \end{array} \quad \begin{array}{r} 147 \\ 318 \\ +32 \\ \hline \end{array} \quad \begin{array}{r} 216 \\ -52 \\ \hline \end{array} \quad \begin{array}{r} 394 \\ -67 \\ \hline \end{array} \quad \begin{array}{r} 53 \\ -21 \\ \hline \end{array} \quad \begin{array}{r} 385 \\ -128 \\ \hline \end{array} \quad \begin{array}{r} 4769 \\ -2880 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 64 \\ \times 4 \\ \hline \end{array} \quad \begin{array}{r} 235 \\ \times 25 \\ \hline \end{array} \quad \begin{array}{r} 208 \\ \times 56 \\ \hline \end{array}$$

$$\begin{array}{r} 3004 \\ -2615 \\ \hline \end{array} \quad (31 \times 4) + 11 = \underline{\hspace{2cm}} \quad (250 \times 10) - 36 = \underline{\hspace{2cm}}$$

(iii)

$$\begin{array}{r} 2056 \\ 341 \\ 5416 \\ +2040 \\ \hline \end{array} \quad \begin{array}{r} 5426 \\ -3507 \\ \hline \end{array} \quad \begin{array}{r} 237 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 36 \\ \times 24 \\ \hline \end{array} \quad \begin{array}{r} 307 \\ \times 23 \\ \hline \end{array} \quad \begin{array}{r} 279 \\ \times 132 \\ \hline \end{array} \quad 26/\overline{7684} \quad 84/\overline{7189} \quad (123 \div 6) + 38 = \underline{\hspace{2cm}}$$

$(302 \times 11) - 105 = \underline{\hspace{2cm}}$      $(42 \times 53) \div 4 = \underline{\hspace{2cm}}$      $(15 \times 62) \div 10 = \underline{\hspace{2cm}}$      $53/\overline{4760}$      $52/\overline{1040}$

$30/\overline{3984}$

(iv)

$$\begin{array}{r} 262 \\ 318 \\ 509 \\ +6384 \\ \hline \end{array} \quad \begin{array}{r} 2056 \\ 3164 \\ +200 \\ \hline \end{array} \quad \begin{array}{r} 307 \\ -218 \\ \hline \end{array} \quad \begin{array}{r} 438 \\ -269 \\ \hline \end{array} \quad \begin{array}{r} 363 \\ \times 48 \\ \hline \end{array} \quad \begin{array}{r} 364 \\ \times 214 \\ \hline \end{array} \quad 11/\overline{132} \quad 28/\overline{2085} \quad 69/\overline{31842} \quad 4/\overline{58}$$

$(362 + 119) \div 4 = \underline{\hspace{2cm}}$     What is  $1/3$  of \$2,43?     $(39 \times 42) \div 2 = \underline{\hspace{2cm}}$      $(204 \times 36) \div 12 = \underline{\hspace{2cm}}$

$32/\overline{7684}$

(v)

$$\begin{array}{r} 2064 \\ 341 \\ 2948 \\ +2005 \\ \hline \end{array} \quad \begin{array}{r} 3644 \\ -2958 \\ \hline \end{array} \quad \begin{array}{r} 4837 \\ -166 \\ \hline \end{array} \quad \begin{array}{r} 17 \\ \times 5 \\ \hline \end{array} \quad \begin{array}{r} 320 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 205 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 65 \\ \times 37 \\ \hline \end{array} \quad \begin{array}{r} 36 \\ \times 40 \\ \hline \end{array} \quad \begin{array}{r} 371 \\ \times 53 \\ \hline \end{array} \quad \begin{array}{r} 560 \\ \times 25 \\ \hline \end{array} \quad 6/\overline{360}$$

$8/\overline{2432}$      $12/\overline{635}$     What is  $1/4$  of \$2,48?

If I have \$3,62 and give  $1/2$  of it away, how much money will I have left?

(vi)

$$\begin{array}{r} 246 \\ \times 32 \\ \hline \end{array} \quad \begin{array}{r} 305 \\ \times 24 \\ \hline \end{array} \quad 38 \overline{)5764} \quad 102 \overline{)35190} \quad \begin{array}{r} 343 \\ \times 28 \\ \hline \end{array} \quad \begin{array}{r} 36 \\ \times 40 \\ \hline \end{array} \quad 67 \overline{)3849} \quad \begin{array}{r} 3.46 \\ +5.01 \\ \hline \end{array} \quad \begin{array}{r} 3.05 \\ +2.08 \\ \hline \end{array}$$

$$\begin{array}{r} 1.57 \\ \times 1.4 \\ \hline \end{array} \quad \begin{array}{r} 8.28 \\ \times 3.2 \\ \hline \end{array} \quad \cdot \quad \frac{1}{2} + \frac{3}{4} = \underline{\quad} \quad \frac{1}{3} + \frac{5}{6} - \frac{1}{4} = \underline{\quad} \quad \text{What is 30\% of 300?}$$

If I have \$20.10 and give  $\frac{3}{4}$  of it away, and then find \$2.00, how much money will I have?



Appendix 5.9: Arithmetic Problems - Set I

(i)

$$\begin{array}{r} 2406 \\ 3519 \\ +2184 \\ \hline \end{array} \quad \begin{array}{r} 3162 \\ 2847 \\ +4006 \\ \hline \end{array} \quad \begin{array}{r} 348 \\ -199 \\ \hline \end{array} \quad \begin{array}{r} 516 \\ -109 \\ \hline \end{array} \quad \begin{array}{r} 2004 \\ -581 \\ \hline \end{array} \quad \begin{array}{r} 50 \\ \times 23 \\ \hline \end{array} \quad \begin{array}{r} 243 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 341 \\ \times 3 \\ \hline \end{array} \quad 2/\overline{565} \quad 11/\overline{73} \quad \begin{array}{r} 25 \\ \times 12 \\ \hline \end{array}$$

$$\begin{array}{r} 5713 \\ \times 7 \\ \hline \end{array} \quad 4/\overline{215} \quad \begin{array}{r} 213 \\ \times 2 \\ \hline \end{array} \quad \begin{array}{r} 470 \\ \times 5 \\ \hline \end{array}$$

(ii)

$$\begin{array}{r} 4176 \\ 304 \\ 2158 \\ +3092 \\ \hline \end{array} \quad \begin{array}{r} 3562 \\ 4619 \\ 2041 \\ +438 \\ \hline \end{array} \quad \begin{array}{r} 36 \\ 204 \\ 317 \\ +402 \\ \hline \end{array} \quad \begin{array}{r} 5631 \\ 9238 \\ +438 \\ \hline \end{array} \quad \begin{array}{r} 36 \\ \times 17 \\ \hline \end{array} \quad \begin{array}{r} 204 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 831 \\ \times 22 \\ \hline \end{array} \quad 33 \times 18 = \quad \begin{array}{r} 542 \\ -31 \\ \hline \end{array} \quad \begin{array}{r} 3817 \\ -2648 \\ \hline \end{array}$$

$$\begin{array}{r} 4378 \\ -989 \\ \hline \end{array} \quad \begin{array}{r} 6053 \\ -2264 \\ \hline \end{array} \quad 6/\overline{284} \quad \begin{array}{r} 153 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 204 \\ \times 6 \\ \hline \end{array}$$

(iii)

$$\begin{array}{r} 4764 \\ -4805 \\ \hline \end{array} \quad \begin{array}{r} 2004 \\ -1326 \\ \hline \end{array} \quad \begin{array}{r} 2640 \\ -1064 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ \times 26 \\ \hline \end{array} \quad \begin{array}{r} 348 \\ \times 204 \\ \hline \end{array} \quad \begin{array}{r} 1054 \\ \times 37 \\ \hline \end{array} \quad 8/\overline{6488} \quad 17/\overline{4718} \quad 11/\overline{1784}$$

$$(113 \times 11) + 250 = \quad (269 \times 10) - 314 = \quad \begin{array}{r} 271 \\ \times 354 \\ \hline \end{array} \quad \begin{array}{r} 360 \\ \times 72 \\ \hline \end{array} \quad 46/\overline{4698}$$

What is  $5/6$  of \$3,06?

(iv)

$$6/\overline{120} \quad 72/\overline{508} \quad 2641 \div 34 = \quad 244/\overline{3089} \quad \begin{array}{r} 279 \\ \times 56 \\ \hline \end{array} \quad (3174 \times 68) \div 12 = \quad \begin{array}{r} 2056 \\ \times 344 \\ \hline \end{array}$$

$$\begin{array}{r} 6462 \\ \times 354 \\ \hline \end{array} \quad 34/\overline{170} \quad 215 \div 29 = \quad \begin{array}{r} 304 \\ \times 280 \\ \hline \end{array} \quad \text{What is } 3/8 \text{ of } 640? \quad \text{What is } 1/2 \text{ of } 210?$$

$$(313 \times 25) \div 36 = \quad 2,76 \times 3,8 =$$

(v)

$$\begin{array}{r} 7536 \\ -2007 \\ \hline \end{array} \quad \begin{array}{r} 3409 \\ -1227 \\ \hline \end{array} \quad \begin{array}{r} 302 \\ \times 47 \\ \hline \end{array} \quad \begin{array}{r} 358 \\ \times 176 \\ \hline \end{array} \quad \begin{array}{r} 2005 \\ \times 17 \\ \hline \end{array} \quad \begin{array}{r} 351 \\ \times 210 \\ \hline \end{array} \quad 64/\overline{1605} \quad 34/\overline{7158} \quad 73/\overline{746}$$

$$(315 \div 5) + 74 = \quad 3,6 + 1,9 = \quad 2,4 + 6,3 = \quad 1/4 + 1 \frac{3}{4} =$$

What is  $1/6$  of \$3,66? What is  $3/8$  of \$2,48?

(vi)

$$\begin{array}{r} 3,6 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 4,71 \\ \times 3,62 \\ \hline \end{array} \quad \begin{array}{r} 2,26 \\ \times 3,00 \\ \hline \end{array} \quad 2,3/\overline{4,82} \quad 1,6/\overline{5,09} \quad (351 \div 15) \times 22 = \quad 2/3 \div 1/5 =$$

$$2 \frac{1}{2} \div 3/8 = \quad 1/3 \times 3/8 = \quad 1 \frac{1}{2} \times 3/4 = \quad \text{What is } 25\% \text{ of } 400?$$

What is 35% of 635?  $17/\overline{3468}$   $74/\overline{5781}$   $16/\overline{5,08}$

Appendix 5.10: Arithmetic Problems - Set J

(i)

$$\begin{array}{r} 37 \\ +26 \\ \hline \end{array} \quad \begin{array}{r} 17 \\ 32 \\ 16 \\ +11 \\ \hline \end{array} \quad \begin{array}{r} 205 \\ 53 \\ +29 \\ \hline \end{array} \quad \begin{array}{r} 64 \\ -52 \\ \hline \end{array} \quad \begin{array}{r} 78 \\ -59 \\ \hline \end{array} \quad \begin{array}{r} 76 \\ -25 \\ \hline \end{array} \quad \begin{array}{r} 30 \\ -21 \\ \hline \end{array} \quad \begin{array}{r} 46 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 382 \\ \times 4 \\ \hline \end{array} \quad \begin{array}{r} 36 \\ \times 41 \\ \hline \end{array} \quad 17 \div 6 = \underline{\hspace{2cm}}$$

$94 \div 2 = \underline{\hspace{2cm}}$      $75 \div 5 = \underline{\hspace{2cm}}$      $(13 + 28) - 19 = \underline{\hspace{2cm}}$      $(63 - 45) + (17 - 6) = \underline{\hspace{2cm}}$

(ii)

$$\begin{array}{r} 14 \\ 37 \\ +64 \\ \hline \end{array} \quad \begin{array}{r} 369 \\ 418 \\ +29 \\ \hline \end{array} \quad \begin{array}{r} 357 \\ -68 \\ \hline \end{array} \quad \begin{array}{r} 476 \\ -58 \\ \hline \end{array} \quad \begin{array}{r} 78 \\ -26 \\ \hline \end{array} \quad \begin{array}{r} 244 \\ -139 \\ \hline \end{array} \quad \begin{array}{r} 6498 \\ -599 \\ \hline \end{array} \quad \begin{array}{r} 10 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 25 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 65 \\ \times 3 \\ \hline \end{array} \quad \begin{array}{r} 457 \\ \times 37 \\ \hline \end{array}$$

$$\begin{array}{r} 402 \\ \times 52 \\ \hline \end{array} \quad \begin{array}{r} 3010 \\ -2876 \\ \hline \end{array} \quad (14 \times 5) + 16 = \underline{\hspace{2cm}} \quad (134 \times 11) - 159 = \underline{\hspace{2cm}}$$

(iii)

$$\begin{array}{r} 2785 \\ 641 \\ 2304 \\ +2409 \\ \hline \end{array} \quad \begin{array}{r} 3426 \\ -2507 \\ \hline \end{array} \quad \begin{array}{r} 325 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 36 \\ \times 54 \\ \hline \end{array} \quad \begin{array}{r} 208 \\ \times 46 \\ \hline \end{array} \quad \begin{array}{r} 251 \\ \times 341 \\ \hline \end{array} \quad 32/\overline{6490} \quad 84/\overline{946} \quad (284 \div 4) + 154 = \underline{\hspace{2cm}}$$

$(213 \times 10) - 305 = \underline{\hspace{2cm}}$      $(34 \times 29) \div 5 = \underline{\hspace{2cm}}$      $(17 \times 38) \div 12 = \underline{\hspace{2cm}}$

(iv)

$$\begin{array}{r} 381 \\ 269 \\ 404 \\ +1892 \\ \hline \end{array} \quad \begin{array}{r} 3041 \\ 2642 \\ +307 \\ \hline \end{array} \quad \begin{array}{r} 304 \\ -286 \\ \hline \end{array} \quad \begin{array}{r} 536 \\ -257 \\ \hline \end{array} \quad \begin{array}{r} 264 \\ \times 28 \\ \hline \end{array} \quad \begin{array}{r} 292 \\ \times 134 \\ \hline \end{array} \quad 11/\overline{121} \quad 37/\overline{4609} \quad 58/\overline{17964} \quad 7/\overline{89}$$

$(314 + 206) \div 3 = \underline{\hspace{2cm}}$     What is  $1/3$  of \$4,23?     $(36 \times 17) \div 4 = \underline{\hspace{2cm}}$      $(305 \times 17) \div 11 = \underline{\hspace{2cm}}$

$41/\overline{3718}$

(v)

$$\begin{array}{r} 3764 \\ 284 \\ 3566 \\ +2200 \\ \hline \end{array} \quad \begin{array}{r} 3057 \\ -1268 \\ \hline \end{array} \quad \begin{array}{r} 5834 \\ -946 \\ \hline \end{array} \quad \begin{array}{r} 16 \\ \times 8 \\ \hline \end{array} \quad \begin{array}{r} 205 \\ \times 9 \\ \hline \end{array} \quad \begin{array}{r} 310 \\ \times 7 \\ \hline \end{array} \quad \begin{array}{r} 64 \\ \times 27 \\ \hline \end{array} \quad \begin{array}{r} 46 \\ \times 30 \\ \hline \end{array} \quad \begin{array}{r} 216 \\ \times 76 \\ \hline \end{array} \quad \begin{array}{r} 460 \\ \times 24 \\ \hline \end{array} \quad 7/\overline{490} \quad 9/\overline{2578}$$

$11/\overline{768}$     What is  $1/8$  of \$2,48?

If I have \$2,44 and give  $1/4$  of it away, how much money will I have left?

(vi)

$$\begin{array}{r} 216 \\ \times 43 \\ \hline \end{array} \quad \begin{array}{r} 208 \\ \times 39 \\ \hline \end{array} \quad 65 \overline{)7946} \quad 313 \overline{)64198} \quad \begin{array}{r} 313 \\ \times 24 \\ \hline \end{array} \quad \begin{array}{r} 64 \\ \times 60 \\ \hline \end{array} \quad 32 \overline{)6439} \quad \begin{array}{r} 1.36 \\ + 2.09 \\ \hline \end{array} \quad \begin{array}{r} 8.08 \\ + 4.09 \\ \hline \end{array} \quad \begin{array}{r} 1.47 \\ \times 1.6 \\ \hline \end{array}$$

$$\begin{array}{r} 7.63 \\ \times 2.3 \\ \hline \end{array} \quad 3/5 + 3/8 = \underline{\quad} \quad 1/4 + 1/2 - 3/8 = \underline{\quad} \quad \text{What is 20\% of 250?}$$

If I have \$10.65 and give  $4/5$  of it away, and then lose another \$2.35, how much money will I have left?

APPENDIX 6

ANAGRAMS

EXPERIMENT 3

Appendix 6.1: Pre-training Anagrams

album	chair	fruit	uncle
ankle	cloth	mince	width
bench	crowd	plant	woman
black	cough	quilt	world
bunch	count	trick	youth

Appendix 6.2: Immediate Post-training Anagrams

block	drink	group	mouth
brick	entry	juice	pitch
cover	filth	lunch	plank
depth	flame	match	scarf
doubt	frown	month	truck

Appendix 6.3: Delayed Post-training Anagrams

crumb	fault	grant	snack
crush	fight	graph	style
drunk	force	knife	thief
faith	front	light	thumb
fancy	glove	prize	watch

## APPENDIX 7

### STATISTICAL TABLES

- 7.1 Analysis of Covariance Assessing Effect of Training on Persistence (Covariate is Pre-Training PerSistence): Experimental Condition (Training, Control) x Sex of Subject - Experiment 1.
- 7.2 Analyses of Variance (Pre-Training Scores): Group (Learned Helpless, Self-Worth) x Sex of Subject - Experiment 2.
- 7.3 Analyses of Covariance Assessing Effect of Training on Deterioration in Performance after Failure (Covariate is Pre-Training Deterioration in Performance after Failure): Group (Learned Helpless, Self-Worth) x Sex of Subject - Experiment 2.
- 7.4 Analyses of Variance (Attributional Ratings): Group (Learned Helpless, Self-Worth) x Occasions (Pre-Training, Post-Training) - Experiment 2.
- 7.5 Analyses of Variance (Deterioration in Performance after Failure, Attributional Ratings): Sex of Trainer x Occasions (Pre-Training, Immediate Post-Training, Delayed Post-Training) - Experiment 3.
- 7.6 Analyses of Covariance Assessing Effect of Sex of Trainer on Deterioration in Performance after Failure (Covariate is Pre-Training Deterioration in Performance after Failure) - Experiment 3.

Appendix 7.1: Analysis of Covariance assessing effect of training on Persistence (Covariate is pre-training Persistence): Experimental Condition (Training, Control) x Sex of Subject - Experiment 1.

<u>Source of Variation</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
Sex	2582,67	1	2582,67	4176,85	1	4176,85	1,64	0,21
Experimental Condition	31781,1	1	3178,1	29577,44	1	29577,44	11,63	0,002
Sex x Experimental Condition	19129,50	1	19129,50	20246,53	1	20246,53	7,96	0,009
Error	80107,16	26	3081,05	63561,66	25	2542,47		
Total	130525,47	29	4500,88					

Appendix 7.2: Analyses of Variance (pre-training scores):  
Group (Learned Helpless, Self-worth), x Sex of  
Subject - Experiment 2.

	<u>Source of Variation</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
Self Esteem	Main Effects	97.26	2	48.63	1.29	0.29
	Group	29.58	1	29.58	0.78	0.39
	Sex	76.05	1	76.05	2.01	0.17
	Group x Sex	5.23	1	5.23	0.14	0.71
	Explained	102.49	3	34.16	0.90	0.45
	Residual	945.31	25	37.81		
	Total	1047.79	28	37.42		
Deterioration in Performance after Failure	Main Effects	16.44	2	8.22	0.93	0.41
	Group	9.81	1	9.81	1.11	0.30
	Sex	8.24	1	8.24	0.93	0.34
	Group x Sex	2.33	1	2.33	0.26	0.61
	Explained	18.77	3	6.26	0.71	0.56
	Residual	220.68	25	8.83		
	Total	239.45	28	8.55		
Response to a Mitigating Circumstance	Main Effects	361.66	2	180.83	13.16	0.00
	Group	340.73	1	340.73	24.80	0.00
	Sex	7.52	1	7.52	0.55	0.47
	Group x Sex	1.63	1	1.63	0.12	0.73
	Explained	363.29	3	121.10	8.81	0.00
	Residual	343.53	25	13.74		
	Total	706.83	28	25.24		
Luck	Main Effects	22.81	2	11.41	3.29	0.05
	Group	3.16	1	3.16	0.91	0.35
	Sex	21.04	1	21.04	6.07	0.02
	Group x Sex	0.00	1	0.00	0.00	0.98
	Explained	22.82	3	7.61	2.20	0.11
	Residual	86.63	25	3.47		
	Total	109.45	28	3.91		
Difficulty	Main Effects	1.31	2	0.65	0.21	0.82
	Group	0.01	1	0.01	0.00	0.97
	Sex	1.27	1	1.27	0.40	0.53
	Group x Sex	0.34	1	0.34	0.11	0.75
	Explained	1.65	3	0.55	0.17	0.91
	Residual	79.80	25	3.19		
	Total	81.45	28	2.91		
Ability	Main Effects	21.86	2	10.93	5.16	0.01
	Group	21.13	1	21.13	9.98	0.004
	Sex	0.16	1	0.16	0.08	0.78
	Group x Sex	0.03	1	0.03	0.01	0.91
	Explained	21.89	3	7.30	3.45	0.03
	Residual	52.93	25	2.12		
	Total	74.83	28	2.67		



	<u>Source of Variation</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Effort	Main Effects	10.81	2	5.41	1.69	0.21
	Group	0.87	1	0.87	0.27	0.61
	Sex	10.42	1	10.42	3.25	0.08
	Group x Sex	0.02	1	0.02	0.01	0.93
	Explained	10.83	3	3.61	1.13	0.36
	Residual	80.13	25	3.21		
	Total	90.97	28	3.25		
Internality	Main Effects	30.90	2	15.45	2.68	0.09
	Group	30.38	1	30.38	5.27	0.03
	Sex	0.03	1	0.03	0.01	0.94
	Group x Sex	0.32	1	0.32	0.06	0.82
	Explained	31.22	3	10.41	1.80	0.17
	Residual	144.23	25	5.77		
	Total	175.45	28	6.27		
Stability	Main Effects	112.48	2	56.24	3.68	0.04
	Group	56.10	1	56.10	3.67	0.07
	Sex	67.36	1	67.36	4.41	0.046
	Group x Sex	0.32	1	0.32	0.02	0.89
	Explained	112.80	3	37.60	2.46	0.09
	Residual	382.23	25	15.30		
	Total	495.03	28	17.68		

Appendix 7.3: Analyses of Covariance assessing effect of training on Deterioration in Performance after Failure (covariate is pre-training Deterioration in Performance after Failure): Group (Learned Helpless, Self-worth) x Sex of Subject - Experiment 2.

<u>Source of Variation</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
Covariate	7,61	1	7,61	0,35	0,56
Main Effects	142,58	2	71,29	3,26	0,06
Group	139,32	1	139,32	6,38	0,02
Sex	0,51	1	0,51	0,02	0,88
Group x Sex	0,01	1	0,01	0,00	0,98
Explained	150,21	4	37,55	1,72	0,18
Residual	524,48	24	21,85		
Total	674,69	28	24,10		

Appendix 7.4: Analyses of Variance (attributional ratings):  
Group (Learned Helpless, Self-worth) x Occasions  
(Pre-training, Post-training) - Experiment 2.

	<u>Source of Variation</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
Luck	Within Cells	138.61	27	5.13		
	Constant	1060.01	1	1060.01	206.48	0.00
	Group	5.66	1	5.66	1.10	0.30
	Within Cells	79.50	27	2.95		
	Occasions	2.98	1	2.98	1.01	0.32
	Group x Occasions	0.08	1	0.08	0.03	0.87
Difficulty	Within Cells	110.81	27	4.10		
	Constant	1019.09	1	1019.09	248.32	0.00
	Group	1.78	1	1.78	0.43	0.52
	Within Cells	40.52	27	1.50		
	Occasions	4.41	1	4.41	2.94	0.10
	Group x Occasions	0.06	1	0.06	0.04	0.81
Ability	Within Cells	85.27	27	3.16		
	Constant	1369.66	1	1369.66	433.68	0.00
	Group	5.80	1	5.80	1.84	0.19
	Within Cells	45.82	27	1.70		
	Occasions	0.91	1	0.91	0.53	0.47
	Groups x Occasions	15.80	1	15.80	9.31	0.005
Effort	Within Cells	65.59	27	2.43		
	Constant	1325.13	1	1325.13	545.46	0.00
	Group	0.79	1	0.79	0.32	0.57
	Within Cells	81.90	27	3.03		
	Occasions	54.76	1	54.76	18.05	0.00
	Group x Occasions	1.03	1	1.03	0.34	0.56
Stability	Within Cells	251.07	27	9.30		
	Constant	0.00	1	0.00	0.00	0.99
	Group	18.83	1	18.83	2.02	0.17
	Within Cells	365.07	27	13.52		
	Occasions	63.66	1	63.66	4.71	0.04
	Group x Occasions	24.55	1	24.55	1.82	0.19
Internality	Within Cells	217.22	27	8.05		
	Constant	105.36	1	105.36	13.10	0.00
	Group	43.16	1	43.16	5.36	0.03
	Within Cells	167.50	27	6.20		
	Occasions	11.16	1	11.16	1.80	0.19
	Group x Occasions	2.88	1	2.88	0.47	0.50

Appendix 7.5: Analyses of Variance (Deterioration in Performance after Failure, attributional ratings): Sex of Trainer x Occasions (Pre-training, Immediate Post-training, Delayed Post-training) - Experiment 3.

	<u>Source of Variation</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
Deterioration in Performance after Failure	Within Cells	628.49	40	15.71		
	Constant	481.09	1	481.09	30.62	0.00
	Sex of Trainer	17.46	1	17.46	1.11	0.30
	Within Cells	693.15	80	8.66		
	Occasions	297.59	2	148.80	17.17	0.00
	Sex x Occasions	14.86	2	7.43	0.86	0.43
Luck	Within Cells	206.79	40	5.17		
	Constant	1811.52	1	1811.52	350.41	0.00
	Sex of Trainer	0.07	1	0.07	0.01	0.91
	Within Cells	131.21	80	1.64		
	Occasions	5.09	2	2.55	1.55	0.22
	Sex x Occasions	5.64	2	2.82	1.72	0.19
Difficulty	Within Cells	192.97	40	4.82		
	Constant	1760.03	1	1760.03	364.83	0.00
	Sex of Trainer	1.49	1	1.49	0.31	0.58
	Within Cells	166.12	80	2.08		
	Occasions	0.42	2	0.21	0.10	0.90
	Sex x Occasions	6.79	2	3.39	1.63	0.20
Ability	Within Cells	284.67	40	7.12		
	Constant	1540.92	1	1540.92	216.52	0.00
	Sex of Trainer	1.28	1	1.28	0.18	0.67
	Within Cells	114.24	80	1.43		
	Occasions	4.06	2	2.03	1.42	0.25
	Sex x Occasions	8.06	2	4.03	2.82	0.07
Effort	Within Cells	207.94	40	5.20		
	Constant	2496.03	1	2496.03	480.15	0.00
	Sex of Trainer	2.46	1	2.46	0.47	0.50
	Within Cells	210.61	80	2.63		
	Occasions	27.47	2	13.73	5.22	0.007
	Sex x Occasions	2.86	2	1.43	0.54	0.58

Appendix 7.6: Analyses of Covariance assessing effect of Sex of Trainer on Deterioration in Performance after Failure (Covariate is pre-training Deterioration in Performance after Failure) - Experiment 3.

	<u>Source of Variation</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Immediate Post-training	Covariate	109.87	1	109.87	7.29	0.01
	Sex of Trainer	2.06	1	2.06	0.14	0.71
	Explained	111.93	2	55.97	3.71	0.03
	Residual	617.94	41	15.07		
	Total	729.73	43	16.97		
Delayed Post-Training	Covariate	12.88	1	12.88	1.16	0.29
	Sex of Trainer	1.20	1	1.20	0.11	0.74
	Explained	14.09	2	7.04	0.64	0.54
	Residual	454.71	41	11.09		
	Total	468.80	43	10.90		